The Effect of HeartMath Techniques on Emotional Intelligence

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Dissertation
submitted to the Faculty of
Holos University Graduate Seminary
in partial fulfillment of the requirements
for the degree of

DOCTOR OF THEOLOGY

The work reported in this thesis is original and carried out by me solely, except for the acknowledged direction and assistance gratefully received from colleagues and mentors.

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Sara Ruth Hake

ACKNOWLEDGEMENTS

unending positive encouragement and for all the many meals cooked for my family. My whole family thanks you, and I love you all.

Mom and Dad, I thank you for your unconditional love, your unwavering support and for modeling that anything is possible when the silent language of love is the foundation. I am blessed to be a part of our family. I love you both.

To my children, Zac, Celeste and Cooper, I thank-you for your kisses, heart felt hugs, home made cards and pictures to brighten my days. You are each beautiful in so many endless ways. I love you.

Lastly, my biggest supporter of all, Steve. Thank-you seems so inadequate for all the love, support and encouragement you give me each day. From computer guru to super Dad and husband, you have my deepest gratitude and love. I love you.

Dominus Illuminatio Mea
(May the Lord Guide Me)

ABSTRACT

This study examined the effects of HeartMath techniques for stress relief on emotional intelligence. The HeartMath techniques implemented were Heart Lock-In®, Neutral® and Freeze-Frame®. The dependent measurement was the BarOn Emotional Quotient Inventory, which contained a total EQ scale along with fifteen sub scales. The independent variable was a one-day, seven-hour workshop, titled *The Power to Change Performance*. The experimental design with control was a pre-test/post-test administered within a six-week interval. A 2x2 mixed factorial statistical design yielded statistically significant differences for Total EQ (p=.001), Stress Tolerance (p=.01), Self-Regard (p=.015), and Happiness (p=.03). Marginal statistical significance was found for Interpersonal Relationship (p=.08) and Reality Testing (p=.07). In total, nine of the fifteen sub scales showed an increase in measurement, strongly suggesting that the practice of HeartMath techniques for six weeks increased emotional intelligence.

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CHAPTER 1:
REVIEW OF LITERATURE AND PROBLEM OVERVIEW

Emotional Intelligence is an academic concept that has been linked to success in one's life[1]. Emotional Intelligence scores can be changed through therapeutic interventions and training programs.[2] HeartMath is a process that consciously focuses positive emotions onto the area around one's heart. Current research indicates that using HeartMath techniques has been associated with self-perceived changes in emotional levels[3]. The purpose of this study is to examine the effect HeartMath techniques have on Emotional Intelligence scores.

The first half of this chapter consists of a review of literature on emotional intelligence and of the emotional intelligence model used in this study. The second half of this chapter will provide a description of HeartMath concepts and research associated with its implementation.

Emotional Intelligence

Emotional Intelligence: A Theoretical Framework

The term 'emotional intelligence' first appeared in behavioral science literature in 1990.[4] John Mayer and Peter Salovey coined the phrase when referring to a set of skills hypothesized to contribute to the accurate appraisal and expression of emotion in oneself and others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan, and achieve in one's life.[5] The concept of determining parameters of emotional intelligence had ancestral roots that could be extrapolated from the definitions of cognitive intelligence. In 1958 David Wechsler published his definition of general intelligence:

"Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his {or her} environment."[6]

This definition alludes to the idea that intelligence is more than cognitive measurements. The ability to think rationally, act purposefully, and to effectively deal with the surrounding environment involved interpersonal and intrapersonal skills. These skills involved the ability to not only be aware of one's own reactions and emotions, but also to be cognizant of the emotions of others in the environment. The capacity to be able to think rationally in interpersonal situations and to deal effectively with one's environment required abilities such as stress tolerance, impulse control, problem solving, reality testing and flexibility. Cognitive testing, otherwise referred to, as IQ testing, did not measure the ability to think rationally on an interpersonal level, act purposefully, or measure how one interacts within the environment. Traditional (cognitive) intelligence testing measured one's capacity to understand, learn, recall, think rationally, solve problems, and apply what one has learned.[7] Cognitive testing provided a significant tool of measurement, but it did not deliver a comprehensive assessment of intelligence. This lack of inclusive measurement could have impeded appropriate comprehensive treatment modalities if too much emphasis is placed on cognitive testing scores alone.

The narrow parameters that cognitive testing provided were an area of contention and a source of academic development for educational and mental health practitioners. The experiential knowledge that two people with similar IQ scores could vary significantly in their ability to succeed in life helped fuel the need to develop additional intelligence tests. In 1983, Harold Gardner proposed a new concept of multiple intelligences. His ground breaking work suggested that intelligence encompasses multiple dimensions, combining a variety of cognitive aspects with elements of non-

cognitive personal intelligence.[8] The population Gardner studied was primarily school

age children; however it provided a catalyst for expanding the idea that intelligence is

something beyond just a cognitive measure. Gardner proposed seven primary types of

intelligence: verbal, mathematical-logical, spatial, kinesthetic, musical, interpersonal and

intrapersonal.[9]

Gardner's interpersonal and intrapersonal categories included the knowledge of

one's own emotions and thoughts. The theory of measuring intelligence that factors in

emotions and thoughts was not new, but it began to gain momentum and acceptance in

the academic world. Research and theories began to infiltrate literary publications.

Many theorists followed Gardner's lead in the expansion of theoretically measuring

intelligence. Feuerstein, Rand, Hoffman, & Miller made inferences on the importance of

including emotional measures,[10] while Averill and Nunley, published their work on

emotional creativity theory, focusing on the value of emotional fulfillment through

emotional creativity.[11] Kaufman & Kaufman,[12] Das, Naglieri, & Kirby[13], and Schutte,

Malouff, Hall, Haggerty, Cooper, Golden, & Dornheim[14] all made theoretical

contributions which fell under the umbrella defining emotional intelligence as the ability

to adaptively perceive, understand, regulate, and harness emotions in the self and others.

More definitions describing the theoretical framework of emotional intelligence

were proposed. Saarni's theory of *emotional competence* in 1999 was noteworthy as she

included the same parameters as the previous set of authors, but further postulated an

additional emphasis on the social aspects of emotional functioning and on self-efficacy.

Saarni believed that emotional competence was a crucial component of social

development and contributed to the quality of interpersonal relationships.[15]

During the time when many clinicians were writing their theories and developing measurements, there were two groups of psychologists already in the process of establishing reliability and validity measurements with respect to their own emotional intelligence tests. Published just one year apart, the author of the first test was Reuven Bar-On, and the second test was co-authored by John Mayer, Peter Salovey and David Caruso.

Reuven Bar-On coined the term "EQ" (emotional quotient) in 1985,[16] when he first introduced his *EQi*, the *BarOn Emotional Quotient Inventory*, self-report model at the American Psychological Association annual convention in 1996.[17] Bar-On used fifteen factors for measurement. His core factors include emotional self-awareness, assertiveness, empathy, realty testing, and impulse control. His supporting factors included self-regard, independence, social responsibility, optimism, flexibility, stress management and tolerance. His resultant factors include problem solving, interpersonal relationship, self-actualization, and happiness.[18] Bar-On's work expounded upon the personal, emotional, and social skills that helped one to cope and succeed within his/her environment.[19] His definition for emotional intelligence was a broader concept when compared with that of Salovey, Mayer and Caruso. Bar-On defined emotional intelligence as,

> "An array of non-cognitive capabilities, competencies, and skills that influences one's ability to succeed in coping with environmental demands and pressures.[20] This array includes 1) the ability to be aware of, to understand, and to express oneself; 2) the ability to be aware of, to understand and to relate to others; 3) the ability to deal with strong emotions and control one's impulses; and 4) the ability to adapt to change and to solve problems of a personal or a social nature."[21]

This broader definition of emotional intelligence was coined a "mixed conception" of emotional intelligence by Salovey, Mayer and Caruso because it

combined together what they perceived as diverse parts of personality.[22] Salovey, Mayer

and Caruso believed that the qualities Bar-On measured in problem solving and reality

testing were more related to ego strength or social competence than to emotional

intelligence.[23] In summary, the EQ-I, a self-report model, measured the non-intellective

factors that impact emotionally-intelligent behavior as reported by the person and was

considered to be a measurement of socially and emotionally intelligent behavior.[24]

Salovey, Mayer and Caruso introduced their first emotional intelligence test, an

ability measure called the Multifactor Emotional Intelligence Scale (MEIS) in 1997.[25]

Four years later a fourth version for professional use was published called the MSCEIT.[26]

The MSCEIT was an acronym for Mayer-Salovey-Caruso Emotional Intelligence Test.

This test was composed of 12 ability tests, which were grouped into 4 branches. Branch

1 was called *perceiving emotions* and was the ability to perceive emotions in oneself and

others, as well as in objects, art, stories, music, and other stimuli. Branch 2 was called

facilitating thought and was the ability to generate, use, and feel emotion as necessary to

communicate feelings, or employ them in other cognitive processes. Branch 3 went by

the name *understanding emotions* and was the ability to understand emotional

information, how emotions combined and progressed through relationship transitions,

and to appreciate such emotional meanings. Lastly branch 4, titled *managing emotions*,

was the ability to be open to feelings, and to modulate them in oneself and others so as to

promote personal understanding and growth.[27]

It would be remiss to not mention the name Daniel Goleman. While Bar-On,

Salovey, Mayer and Caruso were busy conducting research studies to validate their own

emotional intelligence tests, Daniel Goleman published a book in 1995 titled <u>Emotional</u>

Intelligence. It became a best seller that also introduced and educated the world outside

of academia on the concept of emotional intelligence, resulting in an explosion of media

coverage and interest in emotional intelligence. Goleman's easy style of writing and his

way of using everyday examples educated the world on the importance of measuring

intelligence in more ways than by simply cognitive processes. Although he had the

public's attention, Goleman's own test on emotional intelligence measures was not yet

published. As a result, the soon to be published emotional intelligence tests, the BarOn

and MEIS were catalytically moved to into public awareness. Research results from

these two tests were no longer just being published in academic research magazines, but

were subsequently finding their way into mainstream press magazines such as Time,

Newsweek, and Cosmopolitan as well as making front page copy in many newspapers.

Goleman wrote that his theory on emotional intelligence was based upon the work

of Salovey and Mayer with adaptations for the workplace.[28] His definition for emotional

intelligence was,

> "the capacity for recognizing our own feelings and those of others,
> for motivating ourselves, and for managing emotions well in ourselves and
> in our relationships."[29]

Goleman supported this theory by conceptualizing five basic emotional and social

competencies of measurement:

- **Self-awareness:** Knowing what we are feeling in the moment, and using

  those preferences to guide our decision making; having a realistic assessment

  of our own abilities and a well-grounded sense of self-confidence.

- **Self-regulation:** Handling our emotions so that they facilitate rather than interfere with the task at hand; being conscientious and delaying gratification to pursue goals; recovering well from emotional distress.

- **Motivation:** Using our deepest preferences to move and guide us toward our goals, to help us take initiative and strive to improve, and to persevere in the face of setbacks and frustrations.

- **Empathy:** Sensing what people are feeling, being able to take their perspective, and cultivating rapport and attunement with a broad diversity of people.

- **Social Skills:** Handling emotions in relationships well and accurately reading social situations and networks; interacting smoothly; using these skills to persuade and lead, negotiate and settle disputes for cooperation and teamwork.[30]

Goleman's measurements, although based upon the work of Salovey, Mayer and Caruso, varied markedly because he placed an emphasis on social behavior and skills. He felt that a large number of human abilities fell within the emotional intelligence construct, including frustration, tolerance, delay of gratification, motivation, zeal, persistence, impulse control, regulation of mood, ability to empathize, attunement to others, hopefulness, persistence, warmth and optimism.[31] These emphases on social behavior were considered a combination of personality characteristics that Salovey, Mayer and Caruso referred to as a mixed model of emotional intelligence.[32] As with the Bar-On model of emotional intelligence, adherents of the Salovey, Mayer and Caruso model considered the Goleman model too broad in its definition.[33] The authors of the

MSCEIT further stated that the mixed models of emotional intelligence suggested a broader meaning in the public's mind than had been worked out in the scientific literature.[34] Salovey, Mayer and Caruso said the mixed models did not measure emotional intelligence in the sense that they (Salovey, Mayer and Caruso) used the term. They defined their own model as one that identified, "the capacity to reason about emotions, and as the capacity of emotion to enhance thought".[35] Social behavior and personality characteristics such as empathy, motivation, persistence, warmth, and social skills were not a part of emotional intelligence according to the MSCEIT model. The MSCEIT model appears to be unique it its definition of emotional intelligence as the scientific literature shows most theories of emotional intelligence do include aspects of social behavior and personality characteristics..

   To say that current scientific literature ultimately adopted one theoretical view on the definition of emotional intelligence would not be a fair statement. Scientific emotional intelligence literature since the early 1980's has been filled with original theories; some that conflicted with and others that aligned with previous theories. It would be accurate to say that the desire to augment cognitive intelligence testing with an equivalent form of an emotional intelligence test gained popularity not only in the scientific research world, but also in the general public. In the current literature, no emotional intelligence test is considered the premier one. Many scientifically based research studies currently use the empirically based BarOn Emotional Quotient Inventory (EQi) or the MEIS/MSCEIT emotional intelligence tests due to their voluminous data banks and their solid validity and reliability measurements. The strong association in the publics mind between emotional intelligence and the name Daniel Goleman leads me to

believe that, when he does publish his own emotional intelligence test, they will, at least by popular vote, be considered the premier test.

Conceptual Framework of the BarOn Emotional Quotient Inventory
Background

Bar-On crafted his use of the term emotional intelligence to align with David Wechsler's view of intelligence as mentioned above. Seventeen years of research and a wealth of statistically based studies fueled the concept that the backbone of emotional intelligence was actually an "aggregate of abilities, competencies and skills which represent a collection of knowledge used to cope with life effectively."[36]

These targeted abilities, competencies and skills were used in the EQ-i test, which made the Bar-On approach to viewing emotional intelligence multi-factorial. Bar-On wrote that his test was more accurately described as "a self-report measure of emotionally and socially competent behavior that provides an estimate of one's emotional and social intelligence."[37] This test was developed to measure the emotional and social components that made up emotional intelligence and not to measure personality traits or cognitive capacity.[38]

The multi-factorial approach to abilities, competencies and skills were based in the substructure of the EQ-i. The BarOn EQ-i test contained four validity scale scores, a total EQ score, five composite scale scores, and 15 EQ subscales scores. It employed a five-point Likert scale ranging from "very seldom or not true of me" to "very often true of me or true of me." The test related to the potential for performance rather than to the performance itself. It was a measurement of the *potential* to succeed. This was an important distinction because the end point of success was subjective in nature and often

socially influenced. For example, one could view success as either receiving a high grade

in a class or simply finishing a class without a failing grade. Bar-On defined success as

"the end-product of that which one strives to achieve and accomplish; as such, it is very

subjective and potentially socially influenced."[39] Therefore, considering successful

emotional intelligence as the ability to be aware of feelings and using that information to

cope with life was not enough. More skills were needed to determine one's success in

dealing with environmental demands. This was where Bar-On's multi-factorial approach

to abilities, competencies and skills played an important role in helping people recognize

where they needed to place their scrutiny and attention when evaluating their own

emotional intelligence.

Emotional intelligence could be changed. Bar-On stated that, "emotional

intelligence and emotional skills develop over time, change throughout life, and can be

improved through training and remedial programs as well as therapeutic techniques."[40]

This was the beauty of measuring emotional intelligence: scores could be changed.

When looking at the components of emotional intelligence, one could find concepts that

are familiar to the world of self-help and psychology. The ability to have these concepts

identified in a quantifiable manner would help us to become more cognizant of the areas

on which we needed to concentrate in order to self improve our emotional intelligence.

Emotional intelligence tests results could then become a learning tool that would enhance

our awareness of how we interact in the world.

BarOn EQ-i Scales

Numerous studies show a correlation between higher than the norm emotional

intelligence scores and their connection with self-reports of personal

fulfillment/happiness and success in jobs. It is important to examine the fifteen

conceptual components of emotional intelligence measured within its framework. The
conceptual components of emotional intelligence that are measured by the BarOn EQ-i
subscales are described as follows:

- **Self-Regard (SR).** Self-regard is the ability to respect and accept oneself as
  basically good. Respecting oneself is essentially liking the way one is. Self-
  acceptance is the ability to accept one's perceived positive and negative
  aspects as well as one's limitations and possibilities. This conceptual
  component of emotional intelligence is associated with general feelings of
  security, inner strength, self-assuredness, self-confidence, and feelings of self-
  adequacy. Feeling sure of oneself is dependent upon self-respect and self-
  esteem, both of which are based on fairly well developed sense of identity.
  People with good self-regard feel fulfilled and satisfied with themselves. At
  the opposite end of the continuum are feelings of personal inadequacy and
  inferiority.

- **Emotional Self-Awareness (ES).** Emotional self-awareness is the ability to
  recognize one's feelings. It is not only the ability to be aware of one's
  feelings and emotions, but also to differentiate between them, to know what
  one is feeling and why, an to know what caused the feelings, serious
  deficiencies in this area are found in alexithymic (inability to express feelings
  verbally) conditions.

- **Assertiveness (AS).** Assertiveness is the ability to express feelings, beliefs,
  and thoughts and defend our rights in a nondestructive manner. Assertiveness
  is composed of three basic components: (1) the ability to express feelings

(e.g., to accept and express anger, warmth, and sexual feelings), (2) the ability to express beliefs and thoughts openly (i.e., being able to voice opinions, disagree, and to take a definite stand, even if it is emotionally difficult to do and even if one has something to lose by doing so), and (3) the ability to stand up for personal rights (i.e., not allowing others to bother you or take advantage of you). Assertive people are not over-controlled or shy – they are able to outwardly express their feelings (often directly), without being aggressive or abusive.

- **Independence (IN).** Independence is the ability to be self-directed and self-controlled in one's thinking and actions and to be free of emotional dependency. Independent people are self-reliant in planning and making important decisions. They may, however, seek and consider other people's opinions before making the right decision for themselves in the end; consulting others is not necessarily a sign of dependency. Independence is essentially the ability to function autonomously versus needing protection and support—independent people avoid clinging to others in order to satisfy their emotional needs. The ability to be independent rests on one's degree of self-confidence, inner strength, and desire to meet expectations and obligations, without becoming a slave to them.

- **Self-Actualization (SA).** Self-actualization pertains to the ability to realize one's potential capacities. This component of emotional intelligence is manifested in those who become involved in pursuits that lead to a meaningful, rich, and full life. Striving to actualize one's potential involves

developing enjoyable and meaningful activities and can mean a lifelong effort

and an enthusiastic commitment to long-term goals. Self-actualization is an

ongoing, dynamic process of striving toward maximum development of one's

abilities, capacities, and talents. This factor is associated with persistently

trying to do one's best and trying to improve oneself in general. Excitement

about one's interest energizes and motivates one to continue these interests.

Self-actualization is affiliated with feelings of self-satisfaction.

- **Empathy (EM).** Empathy is the ability to be aware of, to understand, and to

  appreciate the feelings of others, it is "tuning in" (being sensitive) to what,

  how, and why people feel the way they do. Being empathetic means being

  able to "emotionally read" other people. Empathetic people care about others

  and show interest in and concern for others.

- **Social Responsibility (RE).** Social responsibility is the ability to demonstrate

  oneself as a cooperative, contributing, and constructive member of one's

  social group. This ability involves acting in a responsible manner, even

  though one may not benefit personally. Socially responsible people have

  social consciousness and a basic concern for others, which is manifested by

  being able to take on community oriented responsibilities. This component

  relates to the ability to do things for and with others, accepting others, acting

  in accordance with one's conscience, and upholding social rules. Socially

  responsible people possess interpersonal sensitivity and are able to accept

  others and use their talents for the good of the collective, not just the self.

People who are deficient in this ability may entertain antisocial attitudes, act abusively towards others, and take advantage of others.

- **Interpersonal Relationship (IR).** Interpersonal relationship skill involves the ability to establish and maintain mutually satisfying relationships that are characterized by intimacy and by giving and receiving affection. Mutual satisfaction includes meaningful social interchanges that are potentially rewarding and enjoyable. Positive interpersonal relationship skill is characterized by the ability to give and receive warmth and affection and to convey intimacy to another human being. This component is not only associated with the desirability of cultivating friendly relations with others, but with the ability to feel at ease and comfortable in such relations and to possess positive expectations concerning social intercourse. This emotional skill generally requires sensitivity toward others, a desire to establish relations, and feeling satisfied with relationships.

- **Reality Testing (RT).** Reality testing is the ability to assess the correspondence between what is experienced and what objectively exists. Reality testing involves a search for objective evidence to confirm, justify, and support feelings, perceptions, and thoughts. Reality testing involves "tuning in" to the immediate situation, attempting to keep things in the correct perspective, and experiencing things as they really are, without excessively fantasizing or daydreaming about them. The emphasis is on pragmatism, objectivity, the adequacy of one's perception, and authenticating one's ideas and thought. An important aspect of this factor is the degree of perceptual

clarity evident when trying to assess and cope with situations; it involves the ability to concentrate and focus when examining ways of copying with situations that arise. Reality testing is associated with a lack of withdrawal from the outside world, a tuning into the immediate situation and lucidity and clarity in perception and thought processes. In simple terms, reality testing is the ability to accurately "size up" the immediate situation.

- **Flexibility (FL).** Flexibility is the ability to adjust one's emotions, thoughts, and behavior to changing situations and conditions. This component of emotional intelligence refers to one's overall ability to adapt to unfamiliar, unpredictable, and dynamic circumstances. Flexible people are agile, synergistic, and capable of reacting to change, without rigidity. These people are able to change their minds when evidence suggests that they are mistaken. They are generally open to and tolerant of different ideas, orientations, ways, and practices.

- **Problem Solving (PS).** Problem solving aptitude is the ability to identify and define problems as well as to generate and implement potentially effective solutions. Problem solving is multi-phasic in nature and includes the ability to go through a process of (1) sensing a problem and feeling confident and motivated to deal with it effectively, (2) defining and formulating the problem as clearly as possible (e.g., gathering relevant information), (3) generating as many solutions as possible (e.g., brainstorming), and (4) making a decision to implement one of the solutions (e.g., weighing the pros and cons of each possible solution and choosing the best course of action). Problem solving is

associated with being conscientious, disciplined, methodical, and systematic

in persevering and approaching problems. This skill is also linked to a desire

to do one's best and to confront problems, rather than avoiding them.

- **Stress Tolerance (ST).** Stress tolerance is the ability to withstand adverse

  events and stressful situations without "falling apart" by actively and

  positively coping with stress. It is the ability to weather difficult situations

  without getting too overwhelmed. This ability is based (1) a capacity to

  choose courses of action for coping with stress (i.e., being resourceful and

  effective, being able to come up with suitable methods, and knowing what to

  do and how it do it), (2) an optimistic disposition toward new experiences and

  change in general and towards one's ability to successfully overcome the

  specific problem at hand (i.e., a belief in one's ability to face and handle these

  situations), and (3) a feeling that one can control or influence the stressful

  situation (i.e., keeping calm and maintaining control). This component of

  emotional intelligence is very similar to what has been referred to as "ego

  strength" and "positive coping." Stress tolerance includes having a repertoire

  of suitable responses to stressful situations. Stress tolerance is associated with

  the capacity to be relaxed and composed and to calmly face difficulties,

  without getting carried away by strong emotions. People who have good

  stress tolerance tend to face crises and problems, rather than surrendering to

  feelings of helplessness and hopelessness. Anxiety often results when this

  component of emotional intelligence is not functioning adequately, which has

an ill effect on general performance because of poor concentration, difficulty I

making decisions, and somatic problems like sleep disturbance.

- **Impulse Control (IC).** Impulse control is the ability to resist or delay an

  impulse, drive, or temptation to act. It entails a capacity for accepting one's

  aggressive impulses, being composed, and controlling aggression, hostility,

  and irresponsible behavior. Problems in impulse control are manifested by

  low frustration tolerance, impulsiveness, anger control problems, abusiveness,

  loss of self-control, and explosive and unpredictable behavior.

- **Optimism (OP).** Optimism is the ability to look at the brighter side of life

  and to maintain a positive attitude, even in the face of adversity. Optimism

  assumes a measure of hope in one's approach to life. It is a positive approach

  to daily living. Optimism is the opposite of pessimism, which is a common

  symptom of depression.

- **Happiness (HA).** Happiness is the ability to feel satisfied with one's life, to

  enjoy one's self and others, and to have fun. Happiness combines self-

  satisfaction, general contentment, and the ability to enjoy life. This

  component of emotional intelligence involves the ability to enjoy various

  aspects of one's life and life in general. Happy people often feel good and at

  ease both at work and leisure; they are able to "let their hair down," and enjoy

  opportunities to have fun. Happiness is associated with a general feeling of

  cheerfulness and enthusiasm. Happiness is a by-product and/or barometric

  indicator of one's overall degree of emotional intelligence and emotional

  functioning. A person who demonstrates a low degree of this factor may

possess symptoms typical of depression, such as a tendency to worry, uncertainty about the future, social withdrawal, lack of drive, depressive thoughts, feelings of guilt, dissatisfaction with one life and, in extreme cases, suicidal thoughts and behavior.[41]

BarOn EQ-i Scoring

These conceptual components are given raw scores, which are converted to standard scores using 100 as the mean with a standard deviation of 15. The details of the statistical development of this test are found in the methodology chapter. For the purposes of understanding research used in this test it is important to realize that the well-functioning, successful, and emotionally healthy individual is one who possesses a sufficient degree of emotional intelligence and an average or above average EQ score.[42] In general, the higher the EQ score, the more positive the prediction for overall success in meeting environmental demands and pressures.[43] Hence the Bar-On definition for emotional intelligence reads as the array of emotional and social knowledge and abilities that influence our overall ability to effectively cope with environmental demands.[44]

EQ-i scores have been identified as a predictive value in social competence and success. A 2002 study which looked at teenagers who were categorized as leaders, joiners or non-joiners found that teenage females classified as leaders exhibited higher total EQ, higher intrapersonal, interpersonal and adaptability scores when compared to the normative sample. In the same light, males identified as leaders exhibited higher adaptability scores than the normative sample. Not surprisingly, teacher ratings of social skills were significantly higher for leaders than the joiners or non-joiners.[45] As this study showed, the over-all EQ scores were significant, but the breakdown of the individual sub-

categories help to further define areas for improvement on which to concentrate if this is desired.

An earlier study looking at managers who were defined as "excellent" according to benchmark measurements found that these adults scored higher in impulse control, independence, and interpersonal relationships when compared to managers not meeting the benchmarked measurements.[46] Superstar CEO's who were assessed on criteria using profitability, had higher scores on empathy, self-regard and assertiveness. In general, the seventy-six CEOS in this Canadian study scored slightly higher than average on total EQ. On the individual scales, they scored above average on independence, assertiveness, optimism, self-actualization and self-regard.[47]

Interpersonal and intrapersonal skills, which include emotional self-awareness, assertiveness, self-regard, self-actualization, independence, empathy, interpersonal relationships and social responsibility are all identified as areas scoring above the mean when looking at success in the work force.[48,49,50,51] This break down of quantifiable measurements becomes helpful when looking at training modalities that will help increase the specific skills, needed for successful job performance.

How effectively one deals with health issues may also have correlations to emotional intelligence scores. Adolescent cancer survivors in a 2000 study by Krivoy, Weyl and Bar-On, indicate that when compared with age and gender matched controls from the normative population, the cancer survivors scored significantly higher on the stress tolerance, assertiveness, independence, self-actualization and optimism scales. By noting these scales, health professionals can then develop action plans and growth related strategies geared toward development in these areas.[52]

Treatment and learning techniques can focus on specific areas when a correlation between outcomes and emotional intelligence are found. For example, when working with clients who are alcohol dependent, a treatment plan which focuses on increasing social responsibility, empathy, problem solving and stress tolerance could generate an increase in favorable outcome measures.[53] In another measurement, totally unrelated to the health field, there is an interesting study that looked at star performance in hockey players. In the EQ-i test, these star performing hockey players scored above the mean in problem solving, happiness and optimism.[54] To say that one must possess these qualities to be a star performer in hockey would be too inclusive. However it does provide data that can be useful in a battery of outcome predictors.

The outcomes of these research studies all imply that EQ-i scores can be useful in helping clients identify areas on which focus their attention when an aspired change is desired. The question then becomes what type of treatment and how long must one practice this modality in order to achieve increases in the desired areas of emotional intelligence or of emotional intelligence as a total score. Currently the published research in the literature using the BarOn Emotional Quotient Inventory shows very little research identifying modalities used to increase emotional intelligence scores. A very small sample study (n=21) of American Express Company employees used a short intervention program designed to improve emotional intelligence. EQ-i tests were administered before the study and then again a few days later. Because of the small sample size, statistically significant results were inhibited, but there are areas of displayed improvement after only a few days. Total EQ increased (p=.08), the intrapersonal composite, self-actualization, empathy and interpersonal relationships all show increases

when looking at the total group of 21 participants. When the results were further

analyzed, the greatest improvement from pretest to posttest of total EQi scores came from

the individuals who began with the lowest EQ-i total scores.[55] Although the results are

not statistically significant, EQ scores did increase. This research is encouraging because

it is an indication that short-term treatment modalities can, at the very least, have an

effect on self-actualization, empathy and interpersonal relationship scales. This also

brings up the question regarding other treatment modalities and their effect on emotional

intelligence scores. Is there a treatment modality, which is quick, easy to understand,

cost effective in its implementation and will increase emotional intelligence?

HeartMath is a trademarked technique, whose goal is to help people to relieve

stress in the moment, and to find levels of personal balance, creativity, intuitive insight

and fulfillment.[56] It is a technique, which involves the consciousness of positive

emotions. The process of using HeartMath techniques includes a blending of skills found

in the five composite scales of the BarOn EQ-i. These five scales encompass the

intrapersonal, interpersonal, adaptability, stress management and general mood

measurement scales. Theoretically it seems possible that learning HeartMath techniques

will increase awareness of the five composite scales and thus emotional intelligence

scores will increase. This assumption provides the theoretical framework for this study.

The next section contains a detailed description of HeartMath.

HeartMath

HeartMath is a concept, a process, and a training modality, which is based upon a

technique that accesses your heart's intelligence. This step-by-step technique is also

scientifically based as it has foundations of research from the fields of biomedical,

psychological and social sciences. It is a process involving emotional wisdom and science. It uses conscious awareness of positive emotions and intuition to create change not only in one's body physiologically, but also emotionally.

The substructure of change experienced after using HeartMath techniques appears to parallel the five composite areas of emotional intelligence found in Reuven Bar-On's EQ-i. The five composite areas of emotional intelligence are intrapersonal, interpersonal, adaptability, stress management and general mood. HeartMath is a scientifically based methodology that produces positive change through accessing the heart's intelligence. Part of this change could affect emotional intelligence.

Doc Childre founded the Institute of HeartMath, a nonprofit educational and research organization in 1991.[57] His work is based upon the concept of Heart Intelligence, which may be defined as follows:

"Heart Intelligence is the intelligent flow of awareness and insight that we experience once the mind and emotions are brought into balance and coherence through a self-initiated, heart-focused process. It underlies cellular organization and guides and evolves organisms toward increased order, awareness and systems coherence." [58]

There is a phrase often used, "follow your heart." Another way of saying this is to follow the wisdom you know is in your heart. Connecting wisdom with the heart is not a new idea. William Shakespeare has a famous quote, "Go to thy bosom, knock there, and ask your heart, what it doth know."

The foundation to HeartMath is that the heart "doth" know much more than we realize. For our physical body, our mental body and our emotional body to perform in optimal health, there needs to be internal harmony that involves coherency between the intelligence of the brain and the intelligence of the heart.

The heart has its own independent nervous system, not controlled by the brain.[59] This concept is seen during a heart transplant. The nerves between the brain and heart are severed, yet the heart will continue to beat after is has been implanted into a new body. Keep in mind; the nerve cells are not manually reattached. The heart has at least forty thousand nerve cells that send messages back and forth to the brain.[60] These neurons affect the functions of the amygdala, thalamus and the cortex, all found within the brain.[61] These three areas of the brain all work together to form our emotional reactions, cultivate our logical reasoning and then communicate/translate all that information into our actions.[62]

The scientific foundations of the idea that our heart can actually influence the thinking part of our brain stemmed from research done by the Lacey team at the Fels Research Institute in the 1970's.[63] Their research showed that not only does the brain send messages through the nervous system to the heart, but the heart also sends messages through the nervous system to the brain. Furthermore, in this research the heart did not always respond to the messages from the brain even though other areas of the body did respond. In contrast, the brain always responded to the messages from the heart.[64] This research indicated that the heart does have an intelligence and can therefore "think for itself" under certain conditions.

HeartMath is based upon the theory that heart intelligence transfers to the emotions and can influence the power of emotional management.[65] Emotional management is a large piece of emotional intelligence. Therefore, by cultivating the capacity to listen to the wisdom from the heart, one can develop a conscious awareness of

one's intuition and emotional management. This piece of becoming more aware of one's

emotions corresponds to Bar-On's intrapersonal sub scale of emotional self-awareness.

Emotions have a wide spectrum of categories. When research was done

comparing the effect emotions had on heart rhythms, it was discovered that negative

emotions created disordered and jagged hearth rhythm patterns. Positive emotions

created smooth, harmonious heart rhythm patterns. This research used patented

technology and a power spectrum analysis. The process involved having a client hooked

up to a heart monitor while s/he consciously thought of situations that produced the

negative or positive emotions.[66] See Figure 1, page 36.

Top Graph: Client experiencing anger; jagged lines.
Bottom Graph: Client experiencing appreciation; smooth, coherent lines.
Source: Reprinted by permission of HeartMath LLC© 2005
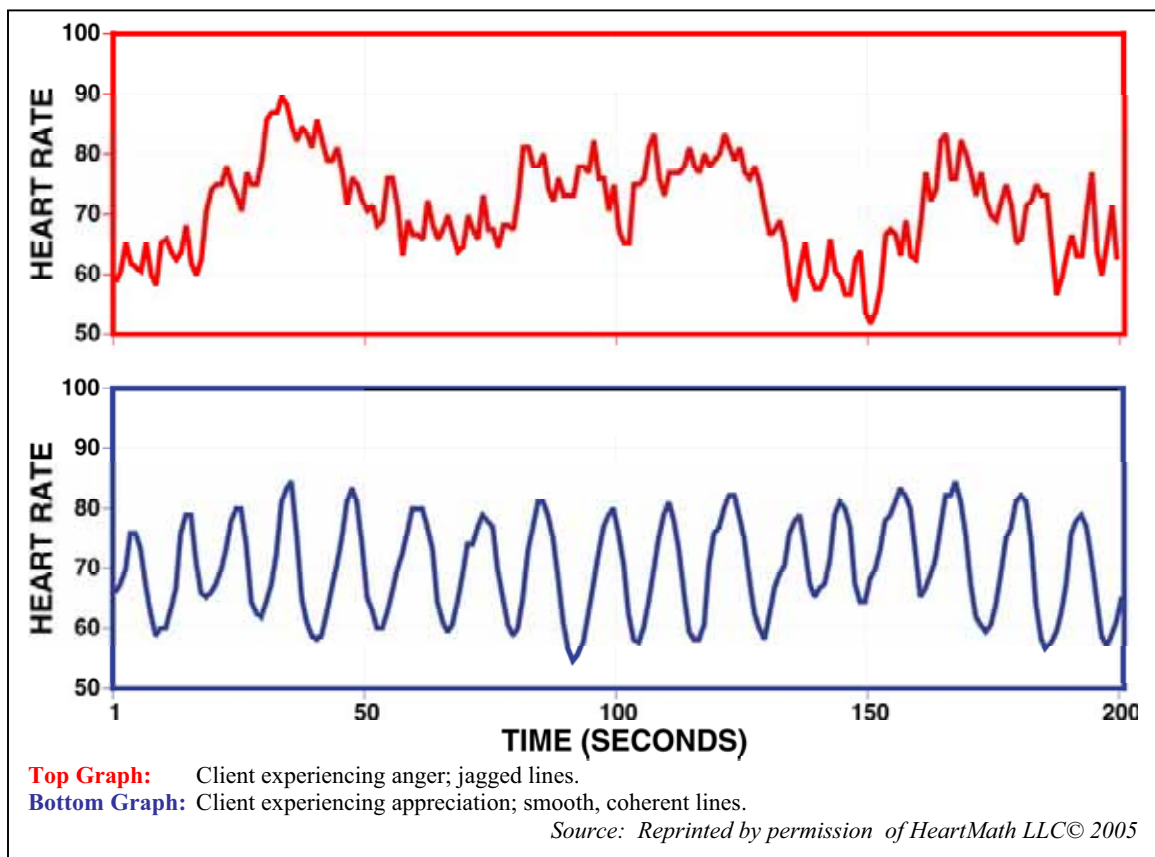
Figure 1.   Heart Rates of Negative and Positive Emotions.

The HeartMath technique builds upon this idea of creating smooth, harmonious

heart rhythm patterns through the process of consciously imagining positive emotional

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scenarios and focusing them figuratively in the area around the heart. Smooth

harmonious heart rhythm patterns are energy efficient and provide a more coherent

communication pathway to the rest of the body.[67] As noted earlier, the Laceys' work in

the area of heart-brain communication shows that the neurological messages from the

heart to brain have higher priority than the messages from brain to the heart. They are

not implying that the brain's messages are unimportant, only that the intelligence of the

heart can over-ride the message from the brain.[68] Therefore, it is important to understand

how the heart communicates with the brain and why a smooth coherent heart rhythm

helps convey messages in a more efficient manner.

The heart communicates with the brain and the rest of the body in three

scientifically validated ways. *Neurologically* the heart communicates through the

transmission of nerve impulses. *Biochemically* it produces hormones and communicates

through neurotransmitters. *Biophysically* the heart communicates through pressure waves

or more commonly referred to as a pulse.[69] All three of these pathways transmit

messages from the heart; these messages include the emotions felt in the area around the

heart.

Neurologically the heart sends messages through the nerves passing through the

spinal column. One of the areas these messages target is the medulla, located in the

brain. The medulla is responsible for regulating breathing, heart rate and other body

functions under control of the autonomic nervous system.[70] This autonomic nervous

system will be discussed in more detail further in this chapter. Neurological messages

from the heart have also been shown to affect the cortex area of the brain, which is

responsible for our reasoning and decision making capabilities.[71] Furthermore, as

mentioned earlier in this chapter, the amygdala, which is the emotional storage bin located in our brain, is also affected by neurological input from the heart.[72] These three areas of the brain, responsible for our emotions, logical thinking and autonomic nervous system can be influenced by messages transmitted neurologically from the heart. Therefore, it is reasonable to say that the intelligence of the heart can affect our body physiologically (autonomic nervous system), emotionally (Amygdala) and cognitively (brain cortex).

The second way our heart can scientifically be proven to communicate with our body is through biochemical secretions. The heart releases into the bloodstream a hormone called ANF, otherwise known as atrial peptide or the atrial natriuretic factor. This hormone helps regulate blood pressure and electrolytes that are crucial to the functioning of the kidneys, adrenal glands and blood vessels among other areas of the body.[73] This balancing hormone is produced and secreted by the atria of the heart.[74]

The pulse is a pressure produced by the heart influencing every body system and organ as it sends oxygen and nutrients to all cells of our body via the blood stream. This biophysical way of communication is the third way the heart has influence over the brain and body systems.[75].

Theoretically, there is a fourth way the heart communicates with the body. This is called energetic communication and involves the electromagnetic strength of the heart's electromagnetic field. The heart's electromagnetic field is the most powerful in the body, five thousand times stronger than the brain's electromagnetic field.[76] Measurement of the heart's electromagnetic field can be detected up to eight feet away in all directions[77]. This implies that the electromagnetic energy of one's heart can be felt not only by every

cell in one's own body, but also by the cells in any other cellular organism up to eight feet away. This information gives theoretical understanding to how one can "intuitively" feel emotions of those around them and react accordingly. See Figure 2, page 39. This electromagnetic field is believed to be donut-shaped (a torus). The figure is a computer-generated model to show the orientation of the field. Technically, the field doesn't stop at the knees.

Source: Reprinted by permission of HeartMath LLC© 2005
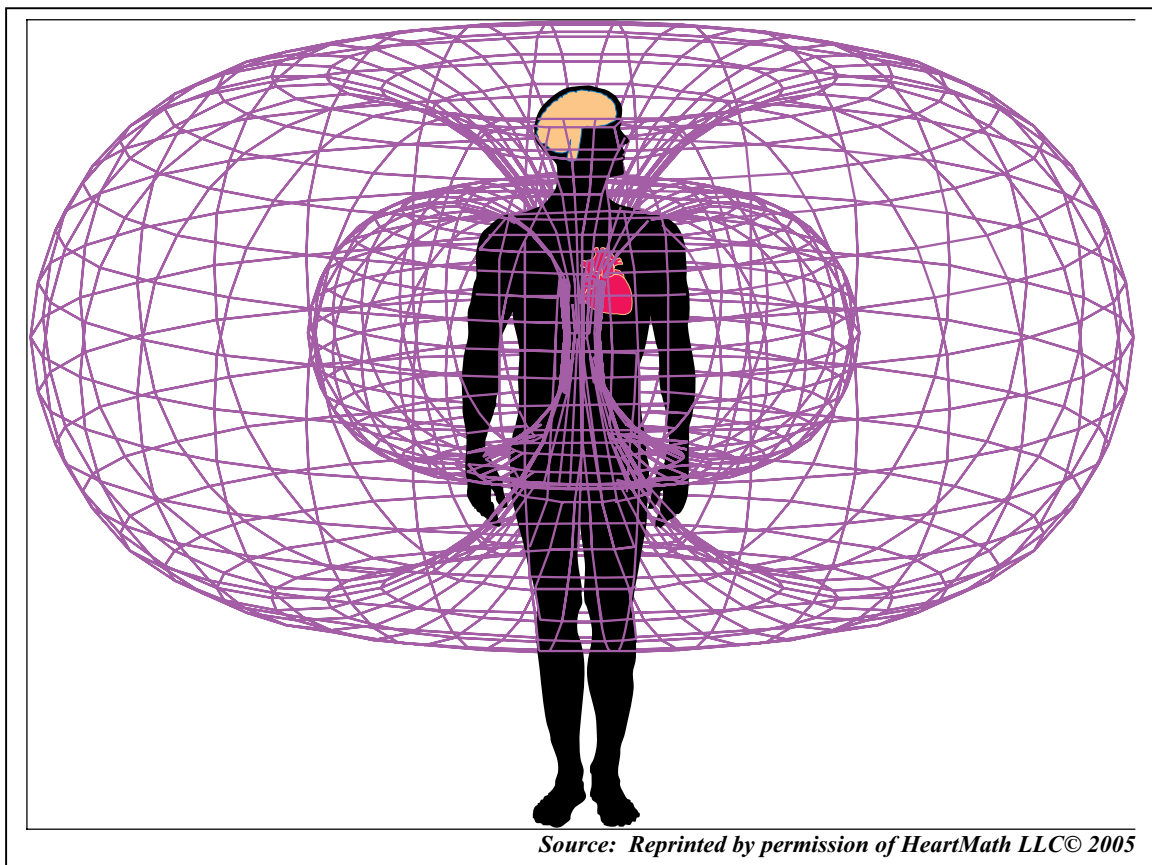
Figure 2. Electromagnetic Field of the Heart.

Based on all of the ways the heart affects the body and brain through emotions, cognitive thinking and the autonomic nervous system, it is not surprising that interventions that focus on the intelligence of the heart, such as HeartMath, would generate positive outcomes in all of these areas.

In the literature research, participants practicing HeartMath techniques also reported increased mental clarity, increased intuition to help with problem solving, an increase in their perceived effectiveness and a perceived decrease in over-all stress.[78] This means that the HeartMath techniques could be affecting the components that make up the stress management scale, the adaptability scale and the general mood scale in the BarOn Emotional Intelligence Quotient Inventory.

The Autonomic Nervous System

It seems remarkable that the simple act of placing positive emotions into our conscious awareness and focusing them in the area around our heart would produce such profound changes as increased mental clarity, increased intuition and a decrease in stress. To understand this on a scientific level, one needs to look toward the autonomic nervous system in the human body. The human body has two system branches operating in the autonomic nervous system. The sympathetic nervous system, also known as the "fight or flight response" is the branch that increases the heart rate, breathing rate, blood flow to skeletal muscles, and also stimulates the release of stress hormones. The sympathetic nervous system is triggered when the body perceives danger. The primary purpose is to slow down blood flow to organs not important for immediate survival such as the digestive tract. It increases blood flow to organs and body systems imperative for survival in emergencies, such as the skeletal muscles needed for movement and smooth muscles to the airway and heart.[79] Please refer to Table 1, page 41 for a more detailed version of sympathetic nervous system effects on the body.

The second branch of the autonomic nervous system is called the parasympathetic nervous system. It is responsible for normalizing the body after an emergency when the

sympathetic nervous system has been triggered. It slows the heart rate, slows

respirations, decreases blood flow to the skeletal muscles and increases stimulation in the

digestive tract.[80] Please refer to Table 1, page 41 for a more detailed version of the

effects the parasympathetic nervous system has on the body. Both of these branches

located in the autonomic nervous system work synergistically and are also affected by

our emotions.

Structure	Sympathetic Stimulation	Parasympathetic Stimulation
Pupil of eye	Dilates	Contracts
Ciliar muscle	Relaxes, accommodates for distance vision	Contracts, accommodates for close-up vision
Stomach muscles	Depresses activity	Increases activity
Glands	Alters secretion	Increases secretion
Liver	Stimulates glycogenolysis	
Visceral muscle of Intestine	Depresses peristalsis	Increases peristalsis
Adrenal medulla	Causes secretion of epinephrine	
Sweat glands	Increases activity	Decreases activity
Coronary arteries	Dilates	Constricts
Abdominal and pelvic Viscera	Constricts	
Peripheral blood vessels	Constricts	
External genitalia	Constricts blood vessels	Dilates blood vessels, causes erection
Bronchial tubes	Dilates	Constricts

(Dossey, 1997, p. 80)

Table 1.   Sympathetic and Parasympathetic Characteristics.

Negative emotions such as anger and fear will stimulate the sympathetic branch,

which can be positive when faced with a fight or flight situation as mentioned above.

What also happens during activation of the sympathetic branch is the release of the

hormone called cortisol. Cortisol is often referred to as the stress hormone. The half-life

of cortisol is 13 hours.[81] This means every time cortisol is being released in the body, it

is effective for approximately 13 hours. Having cortisol released in the body is not a

problem as long as the parasympathetic nervous system has time to help the body recover

from the stress and regulate body systems on a more energy efficient operating level.

Where cortisol in the body system becomes detrimental is when the levels remain too

high. This occurs when the sympathetic nervous system is repeatedly triggered

throughout the day by fight or flight situations or the result of experiencing negative

emotions and repeated feelings of stress. When one feels stressed in any capacity such as

at work, home, in relationships or simply driving down the road, cortisol is released

because the sympathetic nervous system is activated. High levels of cortisol are

associated with chronic health diseases such as obesity, diabetes, hypertension, heart

disease, cancer and Alzheimer's.[82] It is also associated with accelerated aging, impaired

skin elasticity, impaired memory, learning, reduction in bone density, impaired immune

functions, impaired liver function and impaired pancreas functioning.[83]

There is a correlation between cortisol and DHEA. DHEA is considered the anti-

aging hormone, which has protective and regenerative effects on many of the body's

systems.[84] When cortisol increases, DHEA levels decrease. Research using HeartMath

techniques show that positive emotions such as happiness, appreciation, compassion, care

and love reduce the production of the stress hormone cortisol and as a result DHEA

levels have increased.[85]

HeartMath techniques have also been associated with increases in the body's IgA

antibodies[86], which means that the body becomes more effective in fighting disease-

causing microbes. Research also shows that by practicing HeartMath techniques for six

weeks, blood pressures have been lowered without the use of medication. Other

outcomes of using HeartMath techniques are centered on the improvement of quality of

life issues such as decreases in fatigue, sleeplessness, indigestion-related complaints and decreases in body aches.[87] [88] [89]

The practice of using HeartMath techniques has been associated with positive physiological changes such as increases in DHEA levels as well as positive emotional well-being changes such as decreases in stress and stress related complaints and increases in clarity of thought and happiness. Throughout the various research studies using HeartMath techniques, it appears as if the practice of HeartMath will affect emotional intelligence according to the five composite measurements of the BarOn Emotional Quotient Inventory located in Chapter 1. This conclusion supports the assumption of this study that the practice of using HeartMath techniques will increase emotional intelligence.

Statement of the Problem

Cognitive Intelligence was once thought to be the best indicator of success in life, but in the past thirty years, research has increasingly shown that there exists a better indicator for predicting success. This alternative measurement called emotional intelligence has taken on more energy and recognition since the early 1990's. Currently there are two premier tests that have a vast base of reliability and validity measurements associated with their development. The first test, the MEIS/MSCEIT developed by Salovey, Mayer and Caruso, focuses on "involving the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth."[90] In summary, the MSCEIT (an ability quantification) measures the fundamental abilities of

emotional intelligence by operating under the model that emotions and thinking are

linked..[91]   The second emotional intelligence test developed by Reuven Bar-On is titled

the BarOn Emotional Quotient Inventory, EQ-i. This self-report model measures the

non-intellective factors that impact emotionally intelligent behavior as reported by the

person and is considered to be a measurement of socially and emotionally intelligent

behavior.[92] The BarOn EQ-i provides a framework of total EQ measurements along with

fifteen subscales, giving a comprehensive array of measurements. These fifteen

subscales include the following areas: Self-Regard, Emotional Self-Awareness,

Assertiveness, Independence, Self-Actualization, Empathy, Social Responsibility,

Interpersonal Relationship, Reality Testing, Flexibility, Problem Solving, Stress

Tolerance, Impulse control, Optimism and Happiness.

HeartMath techniques were developed to help people deal with stress in their

lives. The original intent was to promote coherent heart rate rhythms, which help

facilitate positive physiological changes in the body. As research results were tabulated,

the outcome measures were also showing increases in self-reported happiness, increased

mental clarity, decreases in anger and decreases in feelings of stress. All of these areas

are directly associated with one or more subscales on the BarOn EQ-i. It stands to reason

that the practice of HeartMath techniques could affect emotional intelligence scores. To

date no research has been published correlating the effects HeartMath has on emotional

intelligence.

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CHAPTER 2:
RESEARCH METHODS

Design

This study is based upon the hypothesis that practicing HeartMath techniques for six weeks will increase emotional intelligence scores. A quasi, nonequivalent control group experimental design was used to test the hypothesis.[1] The purpose of the design was to examine the relationship HeartMath techniques had on emotional intelligence. The three HeartMath techniques used in this study are called Heart Lock-In®, Neutral® and Freeze-Frame®. This chapter discusses the experimental methodology, BarOn Emotional Quotient Inventory tool, HeartMath tools and participants involved in the study.

Participants

Selection Process

A convenience sample of subjects was recruited to participate in this study from Memorial Hospital of South Bend, twenty Churches of various religious affiliations, Notre Dame University and Indiana University. Advertisements for participation were placed in church bulletins, church newsletters, hospital wide email, hospital wide newsletters, University student bulletin boards and word of mouth. Training sessions, pre- and post-tests were administered in conference rooms at Memorial Hospital or educational classrooms in church settings. Subjects were required to be a minimum age of twenty and have had no previous training in HeartMath techniques.

Protection of Human Subjects

This study used a set of instruments in which the subjects were identified only as the intervention or the control group. Each participant read and signed the informed consent that included the study, purpose, procedures, duration, risks, benefits, the subject's rights to confidentiality, and right to withdrawal at any time without penalty. Each participant read and signed a second informed consent for release of their own personal BarOn EQ-i results, which were sent to the address they provided. All study results were secured in a locked file available only to the researcher. The researcher received approval to conduct the research from the IRB research division of Memorial Hospital. All copies of these forms can be found in APPENDIX D, page 125.

Data Collection

Testing Procedures

Control Group Testing Procedures

All classes took place at Memorial Hospital's conference rooms or an office setting. Seating arrangement included rectangular or round tables. The informed consent form was read out loud explaining the purpose of the study, eligibility, procedures, risks and discomforts, benefits, confidentiality, injury statement and request for information. A second informed consent was signed for the participant to receive an individual resource report of his or her own scores from the Bar-On Emotional Quotient Inventory. Questions were answered regarding the study. Informed consent forms were then signed and turned into the primary investigator. A separate demographic data sheet detailing gender, age, marital status, level of education, employment status and hour/week usually worked was explained and filled out by participants. All forms can be found in

APPENDIX C, page 118. The BarOn EQ-i was then administered in the office or

conference room. Six weeks post the originally assigned testing date; participants were

directed to an office or a conference room in the Hospital to complete the posttest of the

BarOn EQ-i.

Intervention Group Testing Procedures

Due to the large number of participants in the intervention group, the training

sessions were divided up into 8 sessions. All classes took place at Memorial Hospital's

conference rooms or at local Church classrooms. Seating arrangement included

rectangular or round tables. The protocol for obtaining consent and the explanation of all

demographic forms was followed as with the control group. Explanation regarding the

daily check list recording the number of times HeartMath was practiced on a daily basis

was then discussed. See APPENDIX C, page 118 for this form. The BarOn EQ-i was

then administered in the conference/classroom. Following completion of the BarOn EQ-

i, there was a fifteen-minute break. Upon completion of the break, a five hour training

session learning and practicing HeartMath techniques was conducted. The intervention

group participants were involved in a seven hour day, including lunch and breaks.

Six weeks after the originally assigned training date; participants were directed to

conference rooms in the Hospital or classrooms in the Churches to complete the post-test

of the BarOn EQ-i. At this time, the worksheets detailing the number of times HeartMath

techniques had been engaged were collected.

BarOn Emotional Quotient Inventory Scale (EQ-i)

The author of the BarOn Emotional Quotient Inventory Scale is Dr. Reuven Bar-

On. He describes an overview of his test and its benefits as:

"Emotionally intelligent people are people who are able to recognize and express their emotions, who possess positive self-regard, and are able to actualize their potential capacities and lead fairly happy lives. They are able to understand the way others feel and are capable of making and maintaining mutually satisfying and responsible interpersonal relationships, without becoming dependent on others. These people are generally optimistic, flexible, realistic, and successful in solving problems and coping with stress, without losing control.

Not only does the EQ-I provide a detailed profile of one's present degree of emotional intelligence and help identify emotional skills that need to be improved, but also it can be used to assess changes that occur over time. As such, the EQ-I can pinpoint strengths and weaknesses in the overall spectrum of emotional intelligence; this information can help predict the individuals' ability to perform and succeed in various situations and areas in life."[2]

The BarOn Emotional Quotient Inventory Scale is available in many testing formats. There is the BarOn EQ-i for Windows, BarOn EQ-i paper version, BarOn EQ-interview, BarOn EQ-i short version, BarOn EQ-i: 125, BarOn EQ-i Youth version, and the BarOn EQ360 assessment. There are three ways to administer the test. Using an item booklet of questions, one can mail or fax in scan able response sheets or one can use the BarOn EQ-i software by completing the test via the Internet. Any of these scoring methods will produce the same printed results. Do to lack of computer access for all participants, the BarOn EQ-i paper and pencil with mail in option was used.

The BarOn EQ-i is made up of 133 brief items and employs a five-point response ranging from "Not True of Me" to "True of Me". It takes approximately 30 to 40 minutes to complete, but no time limits are imposed. The reading level in English has been assessed at the North American sixth grade level. The BarOn EQ-I is suitable for ages 16 and older. The assessment has four validity scales, a total EQ score, five composite scale scores and fifteen subscale scores.[3] The fifteen EQ subscales of the EQ-i are listed in Table 2, page 53 and are described in more detail in Chapter 2, page 21.

Intrapersonal Components	Interpersonal Components	Adaptability Components	Stress Management Components	General Mood Components
Self-Regard (SR)	Empathy (EM)	Reality Testing (RT)	Stress Tolerance (ST)	Optimism (OP)
Emotional Self-Awareness (ES)	Social Responsibility (RE)	Flexibility (FL)	Impulse Control (IC)	Happiness (HA)
Assertiveness (AS)	Interpersonal Relationship (IR)	Problem Solving (PS)		
Independence (IN)				
Self-Actualization (SA)				

Table 2.   EQ Subscales of the BarOn EQ-i.

EQ-i raw scores are converted into standard scores with a mean of "100" and a standard deviation of 15. Standard scores are important because they can then be compared to scores of the normative group and, theoretically, the rest of the population. High EQ-i scores (above 100) indicate "emotionally intelligent" people, while lower scores indicate a need to improve "emotional skills" in specific areas.[4]

The EQ-i has the following features, which makes this test stand out as a measurement for emotional intelligence:

- A large normative database of almost four thousand participants

- Supported by more than seventeen years of research

- A multidimensional scope (a total EQ scale, five EQ composite scales, and fifteen EQ subscales

- Four validity indices

- A correction factor designed to adjust for response bias

- An international and multicultural focus (data were obtained from scores of sites in North and South America, Europe, Asia and Africa)

- Very good statistical reliability and validity

- Versatility (the EQ-i can be used in corporate, educational, clinical, medical, and research settings)

- Brief, easy to use and measure.[5]

Data Analysis

Scoring Overview

The author describes an overview of the scoring process:

Scores for the BarOn EQ-i will almost always be between 55 and 145 (+/-3 standard deviations from the mean). According to distributional theory, scores will fall in this range about 99.9% of the time. Extreme scores are relatively rare, and most respondents achieve total EQ scores around the 100 mark. A respondent's EQ-i scores are determined through a fairly complex scoring process that requires the assigning of "points" to the responses, mathematical transformation of raw scores, the respondent's age and gender, and the normative sample data. By taking all of these factors into account, the EQ-i scores become comparable, meaningful, reliable, valid, and credible

The first step in ascertaining a respondent's EQ-i results is to calculate raw scores for the 15 subscales, five composite factors, total EQ, and validity scales. Each item is assigned "points" from one to five based on the respondent's responses. Some items are scored positively and some items are scored negatively. One hundred and seventeen of the items are linked to one or more of the five composite factors and 15 subscales. Raw scores for the subscales and the composite factors are generated by adding the "points" from the applicable items. The raw total EQ score is achieved by summing the scores for these 117 items. Fifteen other items are related to the Positive Impression scale (8 items) and Negative Impression scale (7 items). The raw scores for these scales are calculated like the total EQ scores, five composite factors, and 15 subscales: Scores from one to five are awarded for each item, and the scores are summed to determine the raw scores. Results for the Inconsistency Index are obtained by comparing the responses to 10 similar items. If someone scores higher that 12 on the Inconsistency Index, the responses are probably invalid.[6]

Verification

Validity of Results

The reliability and validity measurements used in the development of the Bar-On EQ-i will be discussed below. It is important to point out three internal validity measurements used when assessing the EQ-i results. These three involve examining the number of omitted items, the degree of inconsistency in responding to similar types of items, and the degree of overly positive or overly negative impressions.

Ideally the number of omitted items should be 0%; however a rate of 6% or higher makes the test invalid. This omission rate was chosen because it compares to other well-established self-report inventories such as the MMPI-2.[7] The following criteria is used for omission criteria on the composite scales, subscales and validity scales:

- No more than one item may be omitted for subscales composed of seven or eight items

- No more than two items may be omitted for subscales composed of nine or ten items

- No more than three items may be omitted for subscales composed of eleven items.[8]

The Inconsistency Index measures response inconsistency. This number is calculated by summing the differences in scores between the responses of ten pairs of similar items. If a respondent scores higher than 12 on the Inconsistency Index, the results are most likely invalid.[9] The pairs of similar items have correlation factors ranging from $r = .48$ to $r = .64$.

The Positive Impression (PI) and Negative Impression (NI) scale scores are standard scores generated by the same procedure employed in producing the other EQ-i composite scale and subscale scores. These scores are designed to detect respondents who may be giving an exaggerated positive or negative impression of themselves. When the PI or NI scores exceed two standard deviations from the mean (30 points), the results are considered invalid.[10]

Correction Factors

PI and NI scores that do not exceed two standard deviations are used to create a correction factor designed to adjust the EQ-i scales and subscales cores. These correction factors are computed by using a regression analysis. Each EQ-i scale requires a different type of adjustment classified under five types of corrections. Please see Table 3 below.

Correction Type	Scales and Subscales
Type I	Intrapersonal EQ, Emotional Self-Awareness, Problem Solving, Flexibility
Type II	Total EQ, Adaptability EQ, Reality Testing, Stress Tolerance
Type III	Social Responsibility, Impulse Control, Happiness
Type IV	Stress Management EQ, General Mood EQ, Self-Regard
Type V	Interpersonal EQ, Self-Actualization, Interpersonal Relationship, Optimism
No Correction	Assertiveness, Independence, Empathy

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002 [11]

Table 3. Types of Adjustments for Each EQ-i Scale.

Psychometric Properties of Test Development

Reliability

Two types of reliability studies were carried out on the EQ-i: internal consistency and retest reliability. The *internal reliability* refers to the degree all the items of a particular scale measures the construct.[12] Cronbach's alpha was used in the following study found in Table 4, page 57.[13] Cronbach's alpha, (also referred to as coefficient

alpha) is a widely used reliability index that estimates internal consistency or homogeneity of a measure composed of several subparts.

Table 4 below presents the internal consistency coefficients for the EQ-i subscales based on seven population samples. The average Cronbach alpha coefficients range from a "low of .69 (Social Responsibility) to a high of .86 (Self-Regard), with an overall average internal consistency coefficient of .76.[14]

EQ-I	NA1	NA2	NA3	AR	GE	SA	NI	IS	IN	Ave
ES	.80	.78	.80	--	--	.76	--	--	--	.79
AS	.81	.77	.65	.77	.81	.78	.69	.80	.75	.76
SR	.89	.87	.85	.90	.87	.89	.84	.84	.81	.86
SA	.80	.80	.68	.85	.75	.75	.76	.76	.71	.76
IN	.79	.77	.74	.73	.75	.65	.68	.64	.73	.72
EM	.75	.77	.75	--	--	.69	-	--	--	.74
IR	.77	.83	.78	.74	.75	.74	.75	.74	.71	.76
RE	.70	.83	.78	.68	.68	.62	.68	.64	.62	.69
PS	.80	.84	.75	.81	.75	.74	.76	.76	.69	.77
RT	.75	.80	.74	.80	.78	.69	.59	.75	.69	.73
FL	.77	.74	.74	.79	.66	.69	.61	.62	.68	.70
ST	.84	.81	.74	.86	.85	.77	.67	.81	.83	.80
IC	.79	.80	.79	.88	.83	.77	.73	.80	.77	.80
HA	.81	.83	.74	.86	.82	.75	.71	.80	.76	.79
OP	.82	.82	.77	--	--	.72	--	--	--	.79

Notes:
1. EQ-I Abbreviations. ES = Emotional Self-Awareness; AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; EM = Empathy; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness; OP = Optimism.
2. Population Abbreviations: NA1 = North American Normative Sample (n = 3,831); NA2 = North American Military Sample (n = 1,419); NA3 = North American Military Sample (n = 1,146); AR = Argentinean (n = 446); GE = German (n = 168); SA = South African (n = 448); NI = Nigerian (n = 267); IS = Israeli (n = 418); IN = Indian (n = 235); Ave = Average.

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

Table 4.   Internal Consistency Coefficients for the EQ-i Subscales.

The retest reliability refers to its stability over time. Studies comparing two groups in South Africa were retested after one month and then at four months. The average retest reliability coefficient after one month is .85 and after four months is .75. The more stable subscales over time appear to be Self-Regard, Happiness, and Impulse Control.[15] For a complete statistical analysis, refer to Table 5 below.

EQ-I	One-Month	Four-Month
AS	.83	.69
SR	.92	.76
SA	.88	.80
IN	.86	.72
IR	.87	.77
RE	.78	.75
PS	.87	.80
RT	.82	.61
FL	.82	.82
ST	.79	.55
HA	.86	.77

Notes: 1. EQ-I Abbreviations: AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness.
2. Data are from one-month (n = 44) and four-month (n = 27) retest samples in South Africa.

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

Table 5.   Stability Coefficients for One-Month and Four-Month Retest Samples.

Validity

There were nine types of validity measurements made with the development of the BarOn EQ-i. The validity measurements conducted are: content, face, factor, construct, convergent, divergent, criterion-group, discriminate, and predictive validity.

Content and Face Validity are not statistical measurements, but rather how well the items are thought to cover the domain of each of the scales (content) and how easily they are understood by the respondents (face). Item analysis and the collaboration of professional Psychologists examined the sensitivity to item wording. Definitions of the fifteen subscales were deemed appropriate according to the measurements.[16] (See page 22)

Factorial validity examines the instruments subscale structure to measure its empirical and theoretical justification. Data used from the normative sample helped determine which items belonged to appropriate subscales. Using the Varimax Rotation, a

thirteen factor solution, outcomes of the subscales result from the loading = .39 to the

loading = .7.14. A further factor analysis to help understand the overall relationship

among the EQ-i composite scales to the five composite scales was conducted using the

EQS statistical program. The results of the confirmatory factor analysis are presented in

Figure 3, page 59.[17]

Figure 7.1
Parameter Estimates from a Second Order Confirmatory Factor Analysis
of the EQ-i Composite Scales

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002
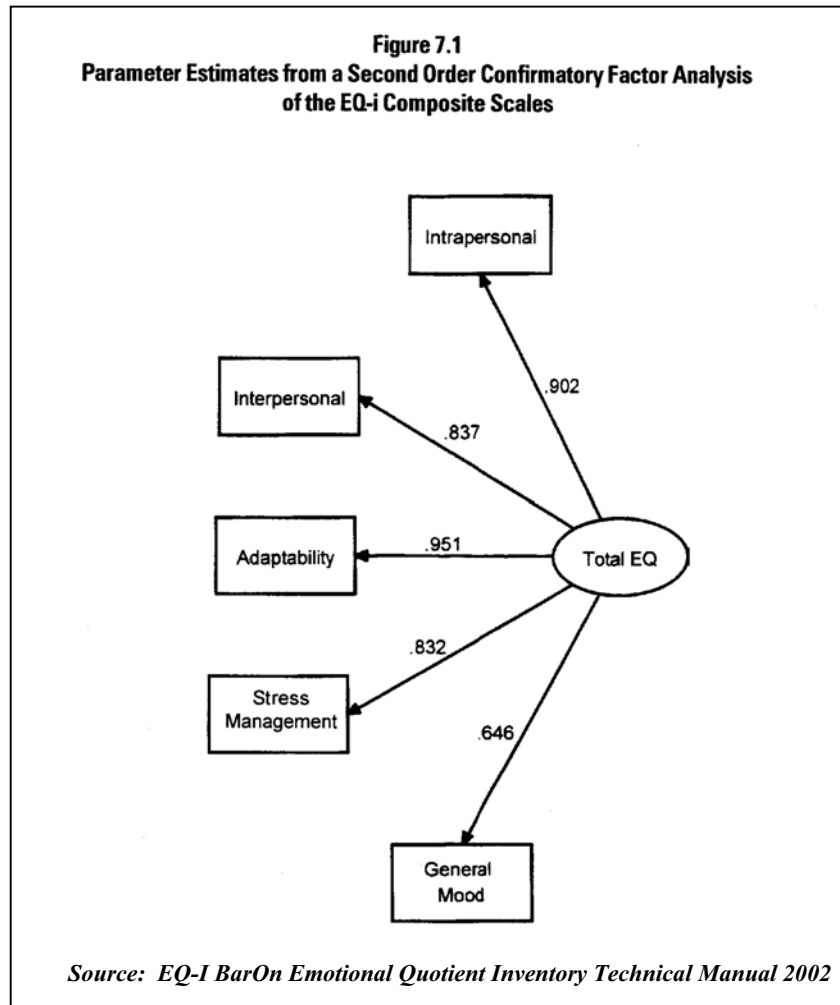
Figure 3. Parameter Estimates from a Second Order Confirmatory
Factor Analysis of the EQ-i Composite Scales.

Using the multi-sample confirmatory factor analysis shows that the five

composite factors of the EQ-i encompasses an overall construct of emotional intelligence.

This finding is consistent for males and females and across age groups. This also

supports that the EQ-i presents a hierarchical structure of emotional intelligence through

the five composite factors and the fifteen subcomponents.[18]

Construct validity analysis covers how well the test actually assesses what it was

designed to assess. Correlations of the subscale scores were measured with scale scores

of other measures. Correlated measurements examining the EQ-i construct validity was

compared to the following measurements:

- Sixteen Personality Factor Questionnaire

- Minnesota Multiphasic Personality Inventory

- Eysenck Personality Questionnaire

- Personality Assessment Inventory

- Symptom check List-Ninety

- Personality Orientation Inventory

- Short Acculturation Scale

- Beck Depression Inventory

- Zung Self-Rating Depression Scale

- Kirkcaldy Quality of Life.[19]

An example comparing reliability to one of the above tests involved the

correlation of the MMPI, using a construct validity comparison. The statistical results

from this study can be found in Table 6, page 61.[20]

MMPI-2	PI	NI	AS	SR	SA	IN	IR	RE	PS	RT	FL	ST	IC	HA	EQ
FRS1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-.68	.00	.00
FRS2	.00	.50	.00	-.48	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
DEP1	-.51	.75	.00	-.50	-.51	.00	-.51	.00	.00	.00	.00	.00	.00	-.52	-.52
DEP2	-.54	.00	.00	-.55	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
DEP3	.00	.00	.00	-.48	-.43	.00	.00	.00	.00	.00	.00	.00	-.57	.00	-.50
DEP4	.00	.00	.00	.00	.00	-.51	.00	.00	-.57	.00	-.47	-.52	-.58	.00	-.58
HEA1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
HEA2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
HEA3	.00	.00	.47	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
BIZ1	.00	.00	.00	.00	.00	.00	-.47	.00	.00	.00	.00	.00	-.74	.00	.00
BIZ2	.00	.00	.00	.00	.0	.00	.00	.00	.00	.00	.00	.00	-.70	.00	.00
ANG1	.00	.00	.00	.00	.00	.00	.00	-.47	.00	.00	.00	.00	-.77	.00	.00
ANG2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-.69	.00	.00
CYN1	.00	.00	.00	.00	.00	.00	.00	-.48	.00	.00	-.56	.00	-.45	.00	.00
CYN2	.00	.00	.00	.00	.00	.00	.00	-.48	.00	.00	.00	.00	.00	.00	.00
ASP1	-.51	.00	.00	.00	.00	.00	-.53	-.53	.00	.00	.00	.00	.00	.00	-.46
ASP2	.00	-.45	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.49	.00
TPA1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-.83	.00	.00
TPA2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
LES1	-.55	.50	.00	-.55	-.58	.00	-.45	.00	.00	.00	.00	.00	-.46	-.56	-.50
LES2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SOD1	.00	.56	-.53	.00	.00	.00	-.85	.00	.00	.00	.00	.00	.00	-.55	-.52
SOD2	.00	.52	-.64	.00	.00	.00	-.59	.00	.00	.00	.00	.00	.00	.00	.00
FAM1	.00	.00	.00	.00	.00	.00	.00	-.45	.00	.00	.00	.00	.00	.00	.00
FAM2	.00	.61	.00	.00	.00	.00	-.53	.00	.00	.00	.00	.00	.00	.00	.00
TRT1	-.60	.76	.00	.00	-.54	.00	-.61	.00	.00	-.54	.00	.00	-.46	-.53	-.59
TRT2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	-.69	.00	.00

Notes:		
	1.	EQ-I Abbreviations: AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness; EQ = Total EQ.
	2.	MMPI-2 Abbreviations: FRT = Fears; DEP = Depression; HEA = Health Concerns; BIZ = Bizzare Mentation; ANG = Anger; CYN = Cynicism; ASP = Antisocial Practices; TPA = Type A; LSE = Low Self-Esteem; SOD = Social Discomfort; FAM = Family Problems; TRT = Negative Treatment Indicators.
	3.	Data are for the Argentinean sample (N = 20).

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

Table 6.   Significant Correlation Coefficients Among EQ-i Subscales and MMPI-2 Content Component Scales.

A summary range of construct validity measurements for each of the areas in the

Bar-On EQ-i can be found in Table 7 below. These include r-value measurements found

in correlation to one or more of the above comparison tests.[21]

Category	Low	High
Total EQ	.33	.85
Self-Regard	.34	.80
Assertiveness	.29	.76
Independence	.36	.76
Self-Actualization	.25	.83
Emotional Self-Awareness	.30	.63
Empathy	.21	.52
Social Responsibility	.30	.65
Interpersonal Relationship	.29	.85
Reality Testing	.27	.58
Flexibility	.35	.85
Problem Solving	.32	.85
Stress Tolerance	.39	.68
Impulse control	.38	.76
Optimism	.41	.67
Happiness	.47	.77

Table 7. Maximum Possible Range of Scores for EQ-i.

The above range of scores is pulled from numerous studies conducted to determine construct validity. These represent the whole range of high and low scores, but not the averages.

Convergent Validity assesses whether the instrument correlates with external measures believed to be of same or similar constructs. Several studies using self-assessments, observer ratings, measurements of acculturation and attributional styles, show the degree of correlation to average .52. See Table 8, page 63 for the statistical results on one study using self-assessments and observer ratings in a South African Sample.

EQ-I	Self-Assessment	Average Observer Rating
AS	.75	.73
SR	.56	.53
SA	.68	.55
IN	.51	.56
IR	.67	.45
RE	.38	.12
PS	.55	.66
RT	.46	.58
FL	.30	.56
ST	.64	.41
HA	.61	.53
EQ	.76	.57

Notes: 1. EQ-I Abbreviations: AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness; EQ = Total EQ.
2. Data are from a South African sample (*n* = 39).

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

Table 8. Correlations Among EQ-i Subscale Scores and Among Self-Assessments and Observer Ratings.

This study validates, along with further studies measuring convergent validity, that the EQ-i truly measures what it was designed to measure (emotional intelligence as defined by the author).[22]

Divergent Validity tests are used to show what the test is not designed to measure. For instance, the emotional intelligence test is not designed to measure cognitive intelligence. Divergent validity tests are often used with construct and convergent validity measures so it becomes clear that the measurements targeted are what they are designed to measure. In a divergent validity focused study involving the Wechsler Adult Intelligence Scale compared to the EQ-i, a North American sample of 40 subjects showed a very low correlation (r = .12). This measurement conveys a divergent validity test between IQ and EQ.[23]

Criterion Group Validity is useful when measuring subjects in clinical and occupational settings. Ongoing data is currently being collected in various occupational areas to determine EQ-i profiles for special groups. Such profiles may eventually be used when selecting clients for certain occupations, professional programs or in any situation where criteria for success would give someone an edge. Table 9 below shows a study comparing the mean differences using t-values and p-values with participants from the Young President's Organization and the Unemployed.[24]

EQ-i	YPO	Unemployed	t-value	p-value
Total EQ	102.8	95.3	3.7	< 0.001
Intrapersonal EQ	105.6	94.5	5.6	< 0.001
Interpersonal EQ	99.4	101.4	-1.0	*ns*
Adaptability EQ	102.1	95.3	3.5	< 0.001
Stress Mgmt EQ	100.0	96.2	1.5	*ns*
General Mood EQ	103.3	97.2	2.0	<0.05
ES	101.2	96.7	2.1	<0.05
AS	108.4	93.2	8.3	<0.001
SR	103.3	95.9	3.5	<0.001
SA	104.1	99.3	2.5	<0.05
IN	111.0	94.8	9.2	<0.001
EM	98.2	103.1	-2.3	<0.05
IR	101.0	100.1	0.4	*ns*
RE	97.2	105.5	-4.4	<0.001
PS	104.6	98.4	3.2	<0.01
RT	100.2	93.4	3.4	<0.001
FL	103.3	97.8	2.8	<0.01
ST	108.7	95.5	4.2	<0.001
IC	94.9	97.3	-1.1	*ns*
HA	101.6	94.3	3.2	<0.01
OP	104.9	100.7	0.9	*ns*

Notes: 1. EQ-I Abbreviations: AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness; EQ = Total EQ.
2. *ns* = not significant

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

**Table 9.   Comparison of Mean Scores of Young President's
Organization and the Unemployed.**

This criterion group validity study shows that there are sixteen areas of significant differences between the Young President's group and the unemployed. It would be

expected there would be differences between two such diverse groups when it comes to occupational success and through the use of criterion group validity; this statistically supports the ability of the EQ-i to differentiate.

Discriminate Validity studies have been conducted in order to examine the EQ-i's ability to differentiate between individuals who are more emotionally intelligent from those who are less emotionally intelligent. The U.S. Air Force study mentioned in Chapter 1 is an example of a discriminate validity test. Table 10 below displays the F-ratios as well as the p-levels outcomes measurements.

EQ-i	Successful	Unsuccessful	*t*-value	*p*-level
EQ	104.4	101.7	2.8	0.01
ES	100.6	98.2	1.8	0.07
AS	106.4	100.4	4.0	0.00
SR	108.8	106.0	2.3	0.02
SA	100.7	96.6	2.9	0.00
IN	108.0	105.3	2.1	0.04
EM	100.9	99.4	1.1	0.26
IR	99.3	97.8	0.9	0.37
RE	106.7	107.8	-0.8	0.41
PS	106.5	101.8	3.4	0.00
RT	108.2	108.0	0.2	0.84
FL	107.5	103.3	3.2	0.00
ST	106.7	102.5	3.4	0.00
IC	102.5	102.2	0.2	0.82
HA	102.3	97.8	3.1	0.00
OP	101.4	97.7	2.7	0.01
Notes: 1. EQ-I Abbreviations: AS = Assertiveness; SR = Self-Regard; SA = Self-Actualization; IN = Independence; IR = Interpersonal Relationship; RE = Social Responsibility; PS = Problem Solving; RT = Reality Testing; FL = Flexibility; ST = Stress Tolerance; IC = Impulse Control; HA = Happiness; EQ = Total EQ. 2. Subject size: Successful N = 461; Unsuccessful N = 149..				

Source: EQ-I BarOn Emotional Quotient Inventory Technical Manual 2002

Table 10. EQ-i Mean Scores for Successful and Unsuccessful U.S. Air Force Recruiters.

In the study, U.S. Air Force recruiters completed the EQ-i and their subscale scores were compared with their success in meeting their recruitment quotas. The degree of success was measured by the percentage of the quota that they were able to fulfill. The

recruiters were divided into a group of "successful recruiters" (those who succeeded in

filling their quota) and "unsuccessful recruiters" (those who filled 70% or less of their

quota). The results of this discriminate validity test show significant mean differences

between "successful" recruiters and "unsuccessful" recruiters for several EQ-i scores than

those who could not meet their goals.[25]

The technical manual for the BarOn-EQ-i summarizes its validity and reliability

as follows:

> "The enormous number of research findings convincingly
> demonstrate that the BarOn EQ-I is clearly a valid and reliable instrument,
> which means that it is quite capable of doing what it was designed to do
> (i.e., to measure emotional intelligence and its factorial components). In
> essence, those who administer this inventory can, with confidence, rely on
> the accuracy and quality of the results that they will receive."[26]

Demographic research samples used in the reliability and validity studies when

developing the BarOn EQ-i are representative of the general population used in this

study. Therefore, it can be theoretically assumed that the validity and reliability

measurements of the BarOn EQ-i are valid and reliable for the confines of this study.

Intervention Procedures

HeartMath Techniques

The intervention training piece of this study involves teaching a HeartMath

copyright and trademark protected program called, *The Power to Change Performance:

An Inner Quality Management® Program.* This program is five hours in length for

content. By adding breaks and lunch, the program becomes a seven-hour day. It includes

a Microsoft Power Point presentation, which is interspersed with scientific research data,

interactive dialog and education involving the techniques and practice of the HeartMath

approach to Inner Quality Management. A brief summary of the training will be

discussed in the following six pages. It is important to point out that the presenter/trainer of this program must be trained and certified by the HeartMath LLC as the processes and materials for this program are licensed, protected intellectual property. For a more complete profile of scientific research involved with the evolvement and effects of the HeartMath techniques, please refer to the literature review, Chapter two.

The Power to Change Performance: An Inner Quality Management® Program is divided into three areas: 1) Research involving the use of HeartMath techniques and its effect on personal, professional and physiological levels; 2) Physiological functioning of the body including heart, brain intelligence, autonomic nervous system, hormonal system functioning and; 3) Explanation and practice of the HeartMath techniques: Neutral®, Freeze-Frame® and Heart Lock-in®.

Practicing HeartMath techniques for six months have been associated with positive physiological, emotional and mental changes such as:

- Decrease in feeling tired

- Decrease in exhaustion

- Decrease in feeling worried

- Decrease in anxiety

- Decrease in anger

- Decrease in sleeplessness

- Decrease in aches and pains

- Systolic blood pressure drop of 8-11 mmHg.[27]

Heart Math techniques have also been associated in the business world with improved communication, productivity and satisfaction along with the following:

- Increase in feelings of being clear headed

- Increase in focus at the job

- Business meetings are better organized

- Less conflict between home and work

- Decrease in desire to leave job.[28]

Looking at the positive effects practicing HeartMath techniques has on overall functioning of the body, it is important to make the connection between change in our environment and the resulting stress signs and symptoms we feel. Focus in this training program begins around the exploration of stress in the workplace, at home and how this plays out in how we feel, think and act not only at work, but also in our personal lives. Examining the change curve, which is patterned after Elizabeth Kubler-Ross's work on death and dying, opens discussion on the phases of change we go through and our personal reactions as well as our physiological reactions to change and stress. Since the purpose of this workshop is to improve health and performance during times of change, we then move the focus to the discussion around optimizing human performance and what that looks like when it is in a healthy phase, reversible fatigue phase or an exhaustion phase.

Physiology of perception is explored as we examine the relationships between the brain's amygdala, thalamus and cortex. Discussion involves the connection between perception, emotions, thoughts, physiological effects and the neural circuits, which keep the cycle of perception moving. Exploration of the neural pathways becomes a segment that explains how the autonomic nervous system works in the body. Hormonal release of cortisol as a stress reaction is explored in detail. The negative effect cortisol has on the

body in terms of chronic disease becomes a focus in the training. Explaining the positive effects of the hormone DHEA in terms of anti-aging properties makes the point hit home when it is also explained that as cortisol increases in our body, our DHEA levels decrease.[29] Detailing research which shows how practicing HeartMath techniques actually decreases cortisol and increases DHEA hormonal levels in the body becomes a powerful message on how HeartMath techniques can make a positive difference in the hormonal system in our bodies.

Explaining the four ways the heart and brain communicate neurologically, biophysically, biochemically, and energetically opens the segment on how heart rate variability and coherence in changing heart rhythms influence the quality of communication between the heart and brain.[30] To sum up this segment of training, coherent heart rhythm signals are created with the use of HeartMath techniques. When coherent, smooth signals are created, there are clear signals being sent between the heart and brain. This has been shown in case studies to lead to changes in the autonomic nervous system balance, such as decreases in blood pressure, changes in the emotional centers of the amygdala and hippocampus, creating feelings of being more balanced emotionally, changes in the hormonal system, such as decreases in cortisol and increases in DHEA, and an increase in communication with the cognitive centers, also called cortical facilitation. This makes the changes in thinking, planning, decision-making and creativity more productive and positive.[31]

At this point in the training, the focus is centered on learning the HeartMath techniques. The first technique is called the Freeze-Frame® tool, and is described as a one-minute power tool for transforming stressful thoughts and emotions into clarity.[32]

This tool is in the category of an "Emotional Refocusing" technique and is used for creating a positive feeling shift. There are five steps:

1. Recognize the stressful feeling, and Freeze-Frame. Take a time out.

2. Make a sincere effort to shift your focus away from the racing mind or disturbed emotions to the area around your heart. Pretend you are breathing through your heart to help focus your energy in the area. Keep your focus there for ten seconds.

3. Recall a positive fun feeling or time you have had in life and attempt to re-experience it.

4. Now, using your intuition, common sense and sincerity—ask your heart, what would be a more efficient response to the situation, one that will minimize future stress?

5. Listen to what your heart says in answer to your question.[33]

Upon learning how to use the Freeze Frame tool, the technique is put into practice using several personal scenarios. Discussion follows this practice.

The second tool of HeartMath is called Neutral®. This is a quick technique, which involves the first two steps of Freeze Frame:

1. Recognize the stressful feeling, and Freeze-Frame. Take a time out.

2. Make a sincere effort to shift your focus away from the racing mind or disturbed emotions to the area around your heart. Pretend you are breathing through your heart to help focus your energy in the area. Keep your focus there for ten seconds.[34]

Following the learning and practicing of these two tools, discussion on coherent communication takes place. Situations involving problems in communication are then looked at through the process of using the Freeze Frame technique. This technique is used to help the participant learn how to not only listen to the words, feelings conveyed in the words, but also listen to the essence of what another person is saying. Listening to the essence, sometimes called the intuitive level, helps decrease miscommunication. This exercise is called Intuitive Listening.

The third and final tool introduced in this workshop and research study is called Heart Lock-In®. This tool is considered to be in the category of "Emotional Restructuring" of long-term patterns. The Heart Lock-In promotes practice or rehearsal time designed to help generate coherence of heart rhythms more consistently.[35] Research conducted using HeartMath's Heart Lock-In shows that once you access your internal coherent state, it will tend to sustain unless you do something to upset the rhythm.[36] Based on this feedback it is then pointed out that the more we practice the art of creating smooth, coherent heart rate rhythms, the easier it is to access that coherent state in addition to building the ability to sustain coherence. Ideally Heart Lock-in should be done daily and in the very least, three to five times per week. After going over the steps, Heart Lock-In is then practiced for fifteen minutes. Steps of the Heart Lock-In technique are:

1. Gently shift your attention to the area around your heart

2. Shift your breathing so that you are breathing in through your heart and out through the solar plexus

3. Activate a genuine feeling of appreciation or care for someone or something in your life

4. Make a sincere effort to sustain feelings of appreciation, care or love while radiating them to yourself and others

5. When you catch your mind wandering, gently focus your breathing back through the heart and solar plexus and reconnect with feelings of care or appreciation.

6. After you're finished sincerely sustain your feelings of care and appreciation as long as you can. This will act as a cushion against recurring stress or anxiety.[37]

Theoretically, the more we access the state of coherent heart rate rhythms, the more we decrease the negative effects stress has on our body physiologically. In the same reasoning, the more we access the state of coherent heart rate rhythms, the more we increase our mental clarity, intuition and understanding of our emotions not only in ourselves, but in others.

Current research indicates that using HeartMath techniques has been associated with changes in emotional levels such as decreases in anger, decreases in feelings of stress, increased happiness and increased mental clarity. This study will use the BarOn Emotional Quotient Inventory Scale to correlate the effects that practicing the HeartMath techniques of Freeze Frame, Neutral and Heart Lock-In has on emotional intelligence scores over a six-week period of time. The statistical tests used to validate the effects HeartMath techniques have on emotional intelligence are discussed in the following section.

Statistical Tests Chosen for Data Analysis

In order to test the hypothesis that HeartMath Techniques will increase emotional intelligence scores after a six-week period of time, two statistical measurements are used. A 2x2 mixed factorial design was used to measure the within-subjects and between-subjects variables. All subjects were given the BarOn Emotional Quotient Inventory pre-test and post-test, and these two together serve as a within-subjects factor (test). The participants were also divided into two groups, the experimental group, receiving the HeartMath training and the baseline, control group. After a six-week period of time, both groups received the posttest, which provides analysis for the between-subjects variables. Using the 2x2 mixed factorial design, it consists of one within subject variable (test), with two levels (pre and post), and one between subjects variable (HeartMath techniques).38 Using this design, ideally the pre-test scores will be equivalent and the post test scores difference between the experimental and control group is the important piece which measures if the intervention had statistical significance. This design compares the post-test mean for the experimental group with the post-test mean for the control group. This design also compares the pre to post changes in the experimental group with the pre to post changes in the control group to provide the statistical significance for within subjects.

A second statistical design, the t-test was used to evaluate the differences between the segregated intervention groups. The intervention group provided further analysis after completion of the study when data compilation revealed that twenty of the eighty-three participants did not practice any HeartMath techniques during the six-week study. A t-test was used to note a statistical difference on the average scores of one or more

variables between the two groups.39 With both statistical tests used, an alpha value of p

≤ .05 was used to determine if the test results were significant.

Chapter 2 Endnotes:

[1] Campbell, Donald, & Stanley, Julian, *Experimental and Quasi-experimental Designs for Research,* (1963).

[2] Bar-On, Reuven, Ph.D., *EQ-I BarOn Emotional Quotient Inventory Technical Manual,* (North Tonawanda, New York: Multi-Health Systems, 2002)143.

[3] Ibid., 3.

[4] Ibid., 3.

[5] Ibid., 4.

[6] Ibid., 30.

[7] Ibid., 41.

[8] Ibid., 41.

[9] Ibid., 41.

[10] Ibid , 42

[11] Ibid., 42.

[12] Ibid., 88

[13] Ibid., 88.

[14] Ibid., 89.

[15] Ibid., 88.

[16] Ibid., 90.

[17] Ibid., 100.

[18] Ibid., 100.

[19] Ibid., 101.

[20] Ibid., 105.

[21] Ibid., 112-117.

[22] Ibid., 119.

[23] Ibid., 127.

[24] Ibid., 129.

[25] Ibid., 131.

[26] Ibid., 142.

[27] Institute of HeartMath. *The Power of Change Performance: An Inner Quality Management® Program,* Power Point slide presentation Leader's Guide (2001) Slides 1,3.

[28] Ibid., slide 2.

[29] Ibid., slide 19.

[30] Ibid., slide 21.

[31] Ibid., slide 23.

[32] Ibid., slide 27.

[33] Ibid., slides 28-31.

[34] Ibid., slide 32.

[35] Ibid., slide 42.

[36] Ibid., slide 42.

[37] Institute of HeartMath. *The Power to Change Performance in Health Care®.* Power Point slide presentation Leader's Guide (2004) slide 30.

[38] Hinton, P. *Statistics Explained: A Guide for Social Science Students.* New York: Routledge, 2001.

[39] Salkind, N. *Statistics For People Who (Think They) Hate Statistics.* London: Sage publications, 2000.

CHAPTER 3:
RESEARCH FINDINGS

This chapter describes the results of the study, including subject demographics, general results, and statistical quantitative data analysis.

Test Subject Demographics

Demographic data were collected on each participant and included age, sex, marital status/involvement in committed relationship, educational level, employment status and hours/week usually worked. Profile sheet used to collect this data is found in APPENDIX B, page 117.

Age

Age divisions for the control and intervention groups are listed in Table 11, 76. The participants in this study ranged in age from twenty to eighty three years. The intervention group had a higher percentage in the age fifty to age seventy ranges with a mean age of 51 years and the control group had a higher percentage in the age twenty to age forty ranges with a mean age of 39 years. This age group difference is significant; $t(96)=3.77$, $p<.01$. Statistical summaries are found in Table 12 and Table 13, page 77.

Age	Intervention	Control
20-29	10	11
30-39	10	11
40-49	15	8
50-59	19	5
60-69	18	2
70-79	3	0
80-89	3	1
No age given	5	0
Total	83	38

Table 11. Ranges of Ages for Intervention and Control Groups.

	Group	N	Mean	Std. Deviation	Std. Error Mean
Age	Control	38	38.7368	13.20050	2.14140
	Intervention	60	50.7000	16.48245	2.12788

Table 12. Group Statistics.

Levene's Test for Equality of Variances				t-test for Equality of Means						
	Equal variances	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Conf. Interval of the Difference	
									Lower	Upper
VAR0002	assumed	1.653	.202	-3.771	96	.000	-11.96316	3.17226	-18.26005	-5.66627
	not assumed			-3.963	90.691	.000	-11.96316	3.01885	-17.96001	-5.96631

Table 13. Independent Samples Test.

Sex

Gender divisions for the control and intervention groups are listed in Table 14. The intervention group had a higher percentage of females when compared to males. The control group had a higher percentage of males when compared to the females. Comparing the proportion of females in the intervention group to the control group; Chi-square = 11.9, p=.001. This indicates significant differences in gender composition between the control and intervention groups. This data is listed in Table 15 and Table 16, page 78.

Age	Intervention Females	Control Females	Intervention Males	Control Males
20-29	9	3	2	8
30-39	7	4	1	7
40-49	9	5	6	3
50-59	12	2	7	3
60-69	16	1	2	1
70-79	3	0	1	0
80-89	3	1	0	0
No age given	5	0	0	0
Total	64	16	19	22

Table 14. Male and Female Division for Intervention and Control Groups.

			Group		Total
			Control	Intervention	
VAR00001	F	Count	16	48	64
		% w/in VAR00001	25.0%	75.0%	100.0%
		% w/in Group	42.1%	76.2%	63.4%
		% of Total	15.8%	47.5%	63.4%
	M	Count	22	15	37
		% w/in VAR00001	59.5%	40.5%	100.0%
		% w/in Group	57.9%	23.8%	36.6%
		% of Total	21.8%	14.9%	36.6%
Total		Count	38	63	101
		% w/in VAR00001	37.6%	62.4%	100.0%
		% w/in Group	100.0%	100.0%	100.0%
		% of Total	37.6%	62.4%	100.0%

Table 15. Gender vs. Group Cross Tabulation.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.863	1	.001		
Continuity Correction	10.440	1	.001		
Likelihood Ratio	11.823	1	.001		
Fisher's Exact Test				.001	.001
N of Valid Cases	101				

Table 16. Chi Square Tests.

Test Scores

Calculations

Twenty of the eighty-three intervention subjects did not perform any of the intervention techniques. The following two tables (Table 17, page 79 and Table 18, page 80), representing the intervention group only, shows t-tests evaluating the differences on the pre-test between those participants that practiced HeartMath techniques and those who did not practice any HeartMath technique during the six week study.   Thirteen of the fifteen scales there exists no statistical significance. However, two scales of Social

Responsibility and Flexibility do show significantly higher scores on the pre-test for
those who did not practice HeartMath techniques.

Group		N	Mean	Std. Deviation	Std. Error Mean
EQ Pre	intervention	63	97.9683	14.93423	1.88154
	intervention non engaged	20	99.6000		3.27221
SR Pre	intervention	63	95.3016	13.75199	1.73259
	intervention non engaged	20	94.4000	22.68410	5.07232
ES Pre	intervention	63	100.0952	16.58285	2.08924
	intervention non engaged	20	102.9500	16.99683	3.80061
AS Pre	intervention	63	95.4444	15.45418	1.94704
	intervention non engaged	20	94.4500	15.50713	3.46750
IN Pre	intervention	63	98.3810	14.80456	1.86520
	intervention non engaged	20	97.4500	15.73623	3.51873
SA Pre	intervention	63	99.9683	16.87427	2.12596
	intervention non engaged	20	95.5000	20.67162	4.62231
EM Pre	intervention	63	104.3810	15.67660	1.97507
	intervention non engaged	20	105.4500	10.09677	2.25771
RE Pre	intervention	63	103.0000	12.42137	1.56494
	intervention non engaged	20	109.4000	8.53106	1.90760
IR Pre	intervention	63	99.0952	16.59354	2.09059
	intervention non engaged	20	97.0000	14.31231	3.20033
ST Pre	intervention	63	96.6984	12.69574	1.59951
	intervention non engaged	20	97.5000	11.94064	2.67001
IC Pre	intervention	63	102.6032	12.95842	1.63261
	intervention non engaged	20	104.7500	10.17673	2.27559
RT Pre	intervention	63	100.7619	12.26418	1.54514
	intervention non engaged	20	102.3000	11.70290	2.61685
FL Pre	intervention	63	93.7619	16.75027	2.11034
	intervention non engaged	20	105.2000	14.15924	3.16610
PS Pre	intervention	63	100.3651	14.51840	1.82915
	intervention non engaged	20	102.9500	13.34748	2.98459
OP Pre	intervention	63	99.3492	14.44362	1.81972
	intervention non engaged	20	98.8500	16.10909	3.60210
HA Pre	intervention	63	95.7937	18.33484	2.30997
	intervention non engaged	20	97.7500	15.75428	3.52276

Table 17. T-test: Intervention vs. Non-Engaged Intervention.

Levene's Test for Equality of Variances			t-test for Equality of Means							
									95% Conf. Interval of the Difference	
Equal variances	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Lower	Upper
EQ Pre assumed	.275	.602	-.428	81	.670	-1.63175	3.81503		-9.22246	5.95897
not assumed			-.432	32.551	.668	-1.63175	3.77459		-9.31524	6.05175
SR Pre assumed	12.680	.001	.216	81	.830	.90159	4.18169		-7.41866	9.22183
not assumed			.168	23.594	.868	.90159	5.36006		-10.17113	11.97430
ES Pre assumed	.006	.938	-.667	81	.507	-2.85476	4.28127		-11.37315	5.66362
not assumed			-.658	31.341	.515	-2.85476	4.33700		-11.69623	5.98670
AS Pre assumed	.000	.983	.251	81	.803	.99444	3.96962		-6.90386	8.89274
not assumed			.250	31.898	.804	.99444	3.97675		-7.10694	9.09583
IN Pre assumed	.776	.381	.241	81	.810	.93095	3.85712		-6.74351	8.60541
not assumed			.234	30.441	.817	.93095	3.98251		-7.19749	9.05939
SA Pre assumed	4.614	.035	.976	81	.332	4.46825	4.57818		-4.64090	13.57740
not assumed			.878	27.511	.387	4.46825	5.08778		-5.96193	14.89844
EM Pre assumed	2.818	.097	-.286	81	.776	-1.06905	3.73718		-8.50487	6.36678
not assumed			-.356	50.199	.723	-1.06905	2.99969		-7.09350	4.95541
RE Pre assumed	1.096	.298	-2.145	81	.035	-6.40000	2.98397		-12.33717	-.46283
not assumed			-2.594	46.698	.013	-6.40000	2.46739		-11.36459	-1.43541
IR Pre assumed	.068	.795	.507	81	.613	2.09524	4.12898		-6.12013	10.31061
not assumed			.548	36.631	.587	2.09524	3.82265		-5.65282	9.84330
ST Pre assumed	.142	.707	-.249	81	.804	-.80159	3.21404		-7.19653	5.59335
not assumed			-.258	33.752	.798	-.80159	3.11246		-7.12857	5.52540
IC Pre assumed	.705	.404	-.677	81	.501	-2.14683	3.17286		-8.45982	4.16617
not assumed			-.767	40.320	.448	-2.14683	2.80066		-7.80577	3.51212
RT Pre assumed	.000	.999	-.494	81	.623	-1.53810	3.11450		-7.73497	4.65878
not assumed			-.506	33.317	.616	-1.53810	3.03897		-7.71870	4.64251
FL Pre assumed	.180	.673	-2.754	81	.007	-11.43810	4.15266		-19.70059	-3.17560
not assumed			-3.006	37.372	.005	-11.43810	3.80496		-19.14509	-3.73110
PS Pre assumed	.031	.862	-.707	81	.482	-2.58492	3.65798		-9.86315	4.69331
not assumed			-.738	34.463	.465	-2.58492	3.50051		-9.69528	4.52544
OP Pre assumed	1.160	.285	.131	81	.896	.49921	3.81163		-7.08475	8.08316
not assumed			.124	29.350	.902	.49921	4.03566		-7.75037	8.74878
HA Pre assumed	.571	.452	-.429	81	.669	-1.95635	4.55906		-11.02745	7.11475
not assumed			-.464	36.769	.645	-1.95635	4.21258		-10.49366	6.58096

Table 18. T-test: Independent Samples Test.

Twenty of the eighty-three intervention subjects did not perform any of the intervention techniques. Therefore, they were dropped from the statistical analyses that follow, leaving sixty-three intervention subjects. As a note, not all intervention subjects that practiced one of the three intervention techniques actually practiced all of them. Please refer to APPENDIX G, page 152 (and specifically Table 39, page 152 and Table 40, page 153) for comparison of how often HeartMath techniques were practiced along with their corresponding EQ-i scores.

Each of the fifteen subscales and total EQ scale will be discussed using the 2x2 mixed factorial design which shows statistical significance within-subjects and between subjects for both the intervention and control group comparisons.

Statistical Results

Total Emotional Intelligence (EQ) Scale.
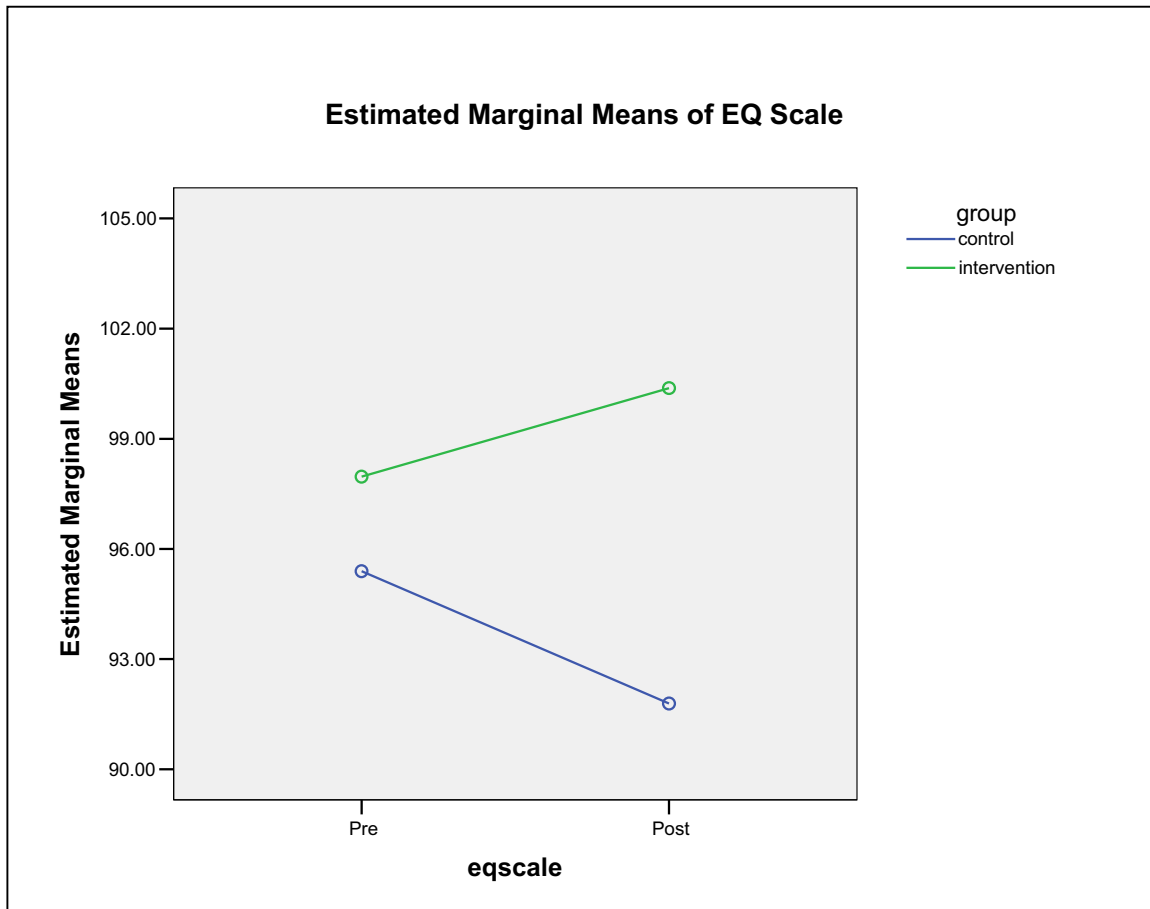
Figure 4. Estimated Marginal Means of EQ Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the total EQ scale (of the EQ-i), as illustrated in Figure 4 above. This interaction was statistically significant ($F_{[1,99]}=12.70$, $p=.001$), indicating that while the control group showed a decline, the intervention group's total emotional intelligence scores improved significantly across the study period.

Self Regard (SR) Scale
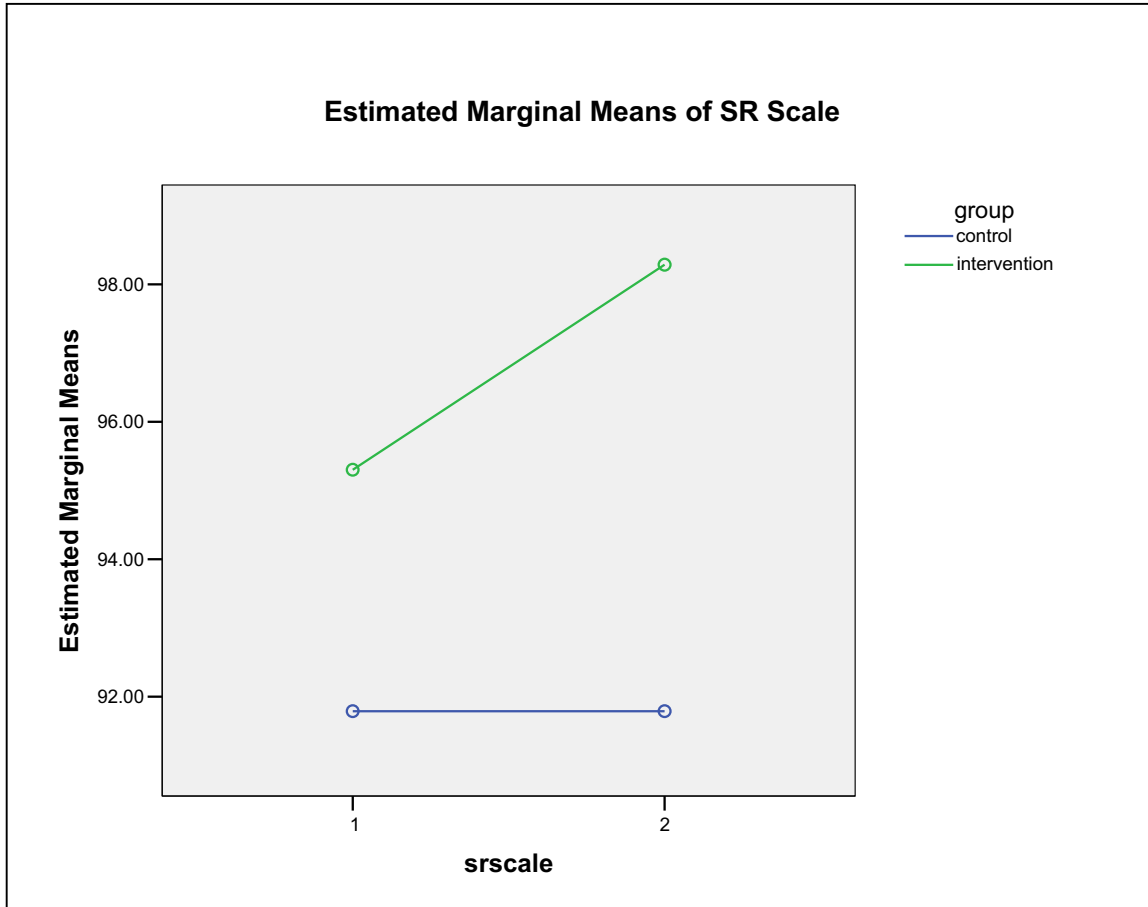
Figure 5.   Estimated Marginal Means of SR Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the Self Regard scale as illustrated in Figure 5 above. This interaction was statistically significant (F[1,99]=6.11, P=.015), indicating that while the control group remained the same, the intervention group's Self Regard scores improved significantly across the six-week study period.

Stress Tolerance (ST) Scale
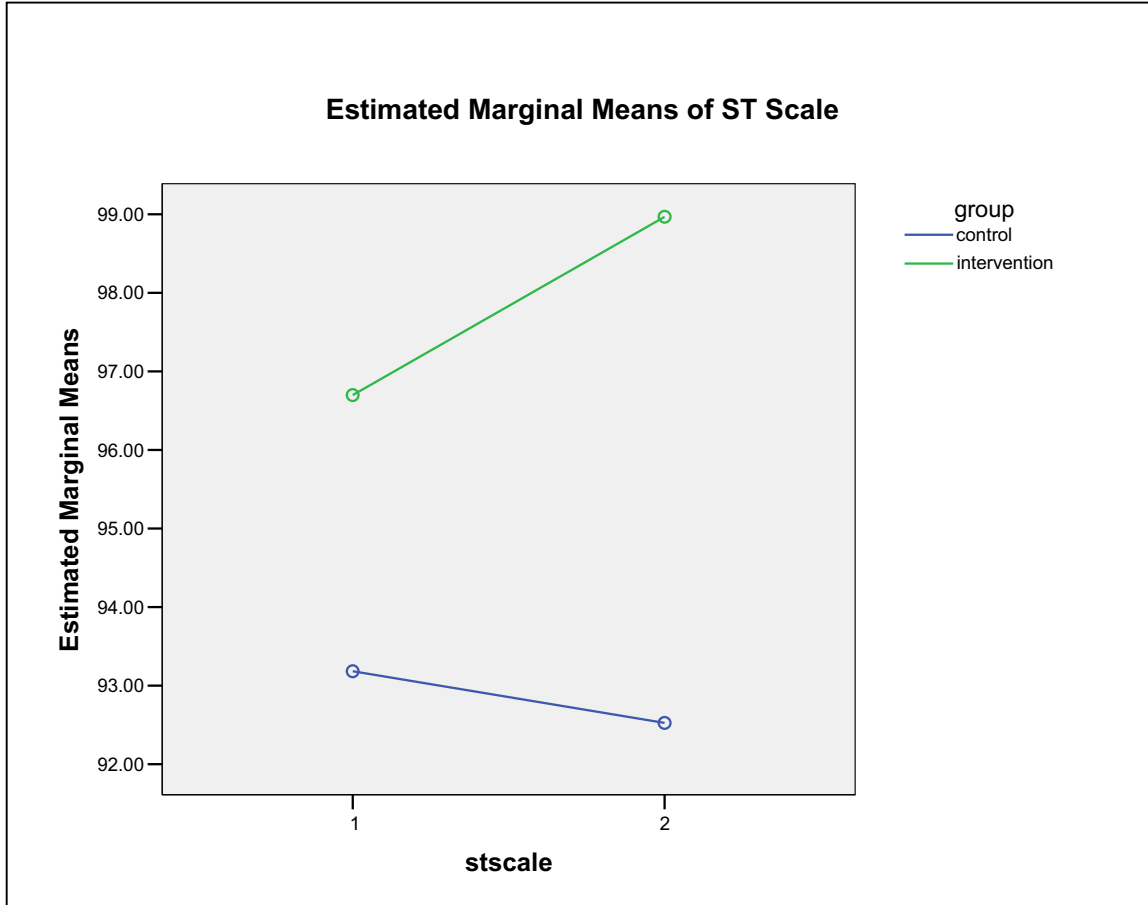
Figure 6.   Estimated Marginal Means of ST Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the Stress Tolerance scale as illustrated in Figure 6 above. This interaction was statistically significant ($F[1,99]=6.13$, P=.01), indicating that while the control group showed a decline, the intervention group's Stress Tolerance scores improved significantly across the six-week study period.

Happiness (HA) Scale

Estimated Marginal Means of HA Scale
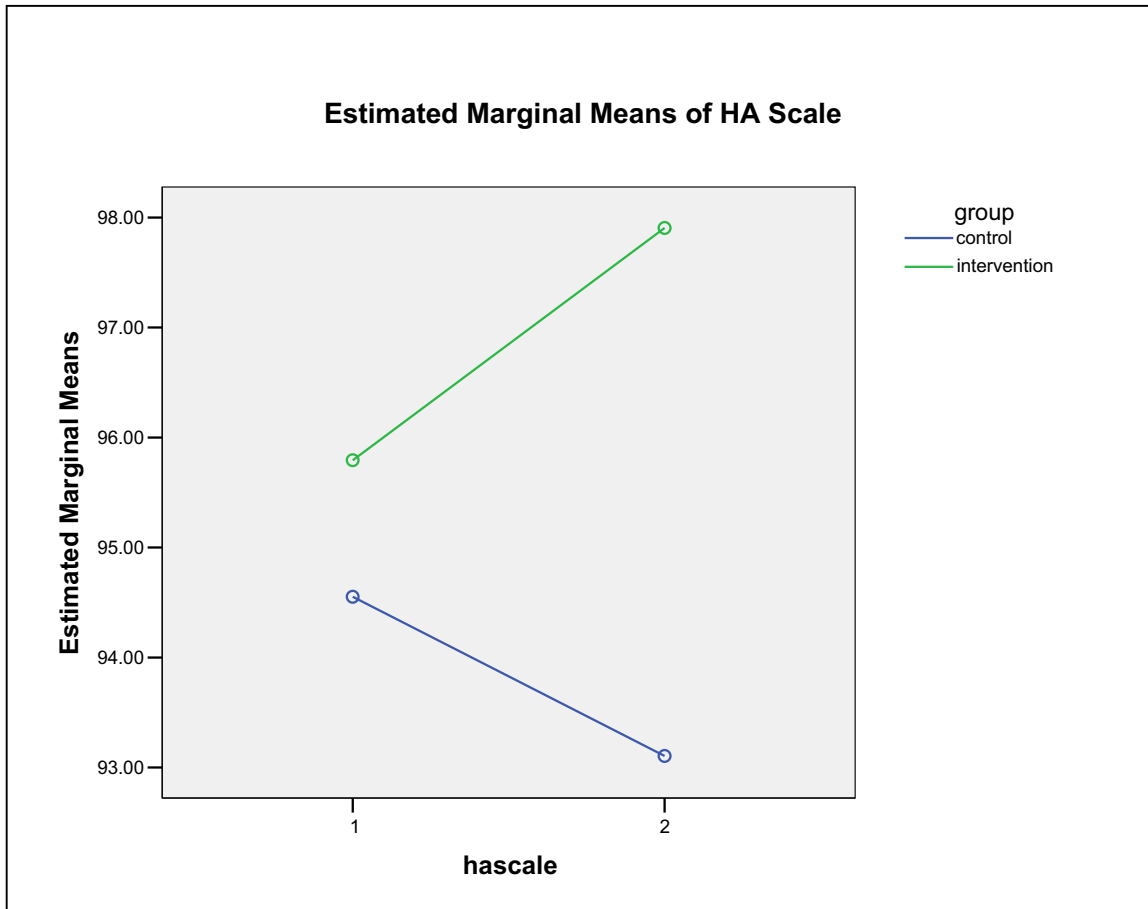
Figure 7.   Estimated Marginal Means of HA Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the Happiness scale as illustrated in Figure 7 above. This interaction was statistically significant ($F[1,99]=5.01$, $P=.03$), indicating that while the control group showed a decline, the intervention group's Happiness scores improved significantly across the six-week study period.

Reality Testing (RT) Scale
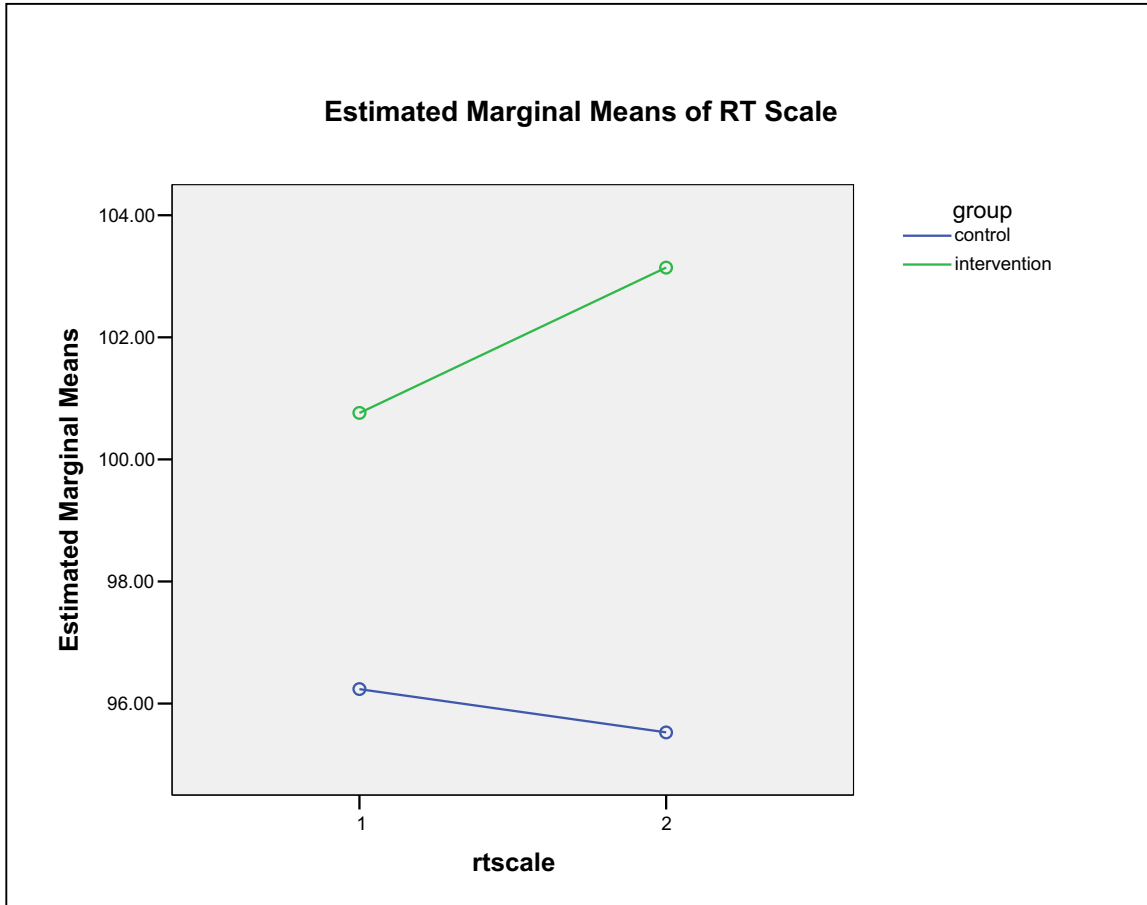
Figure 8.   Estimated Marginal Means of RT Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the Reality Testing scale, as illustrated in Figure 8 above. This interaction was marginally statistically significant ($F[1,99]=3.31$, $p=.07$), indicating that while the control group showed a decline, the intervention group's Reality Testing scores improved marginally significantly across the study period.

Interpersonal Relationship (IR) Scale
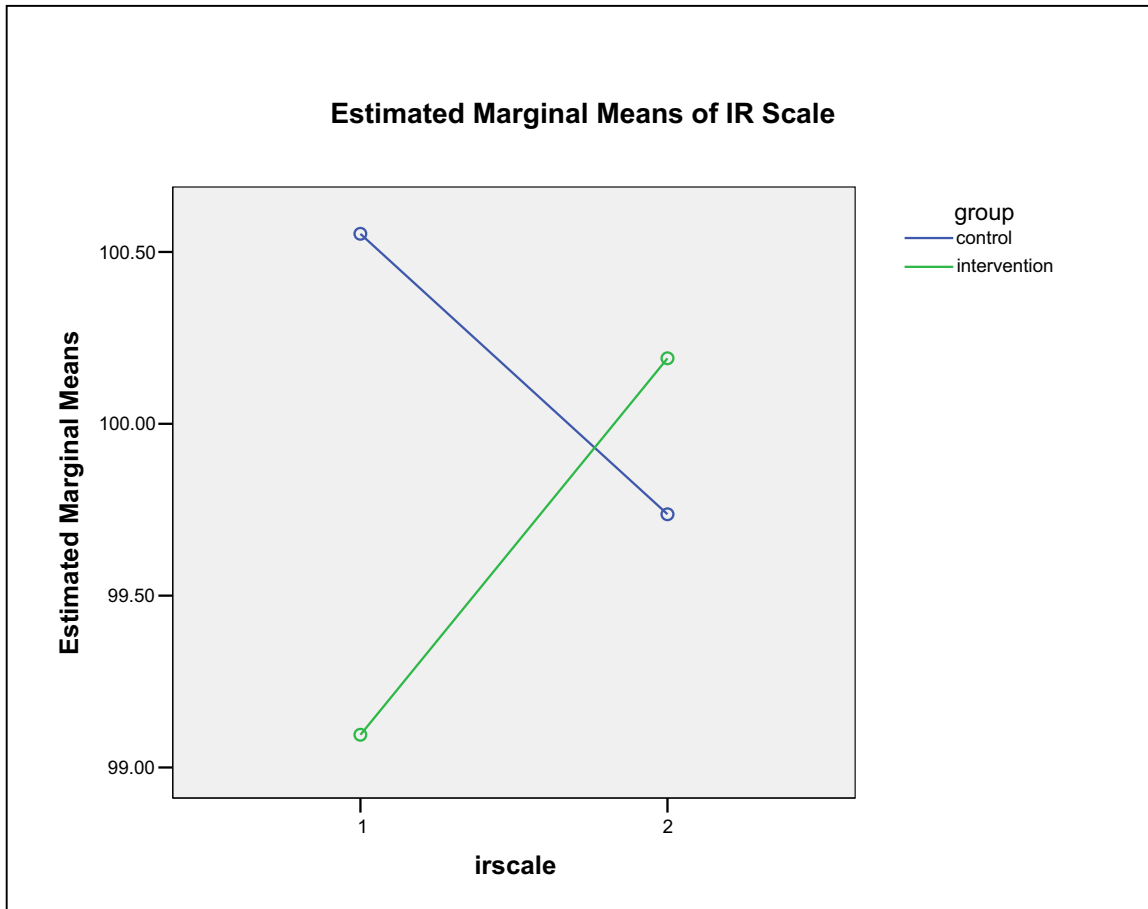
Figure 9.   Estimated Marginal Means of IR Scale.

The control and intervention groups showed significantly different patterns from pretest to posttest on the Interpersonal Relationship scale, as illustrated in Figure 9 above. This interaction was marginally statistically significant ($F[1,99]=3.08$, $p=.08$), indicating that while the control group showed a decline, the intervention group's Interpersonal Relationship scores improved marginally significantly across the study period.

Independence (IN) Scale
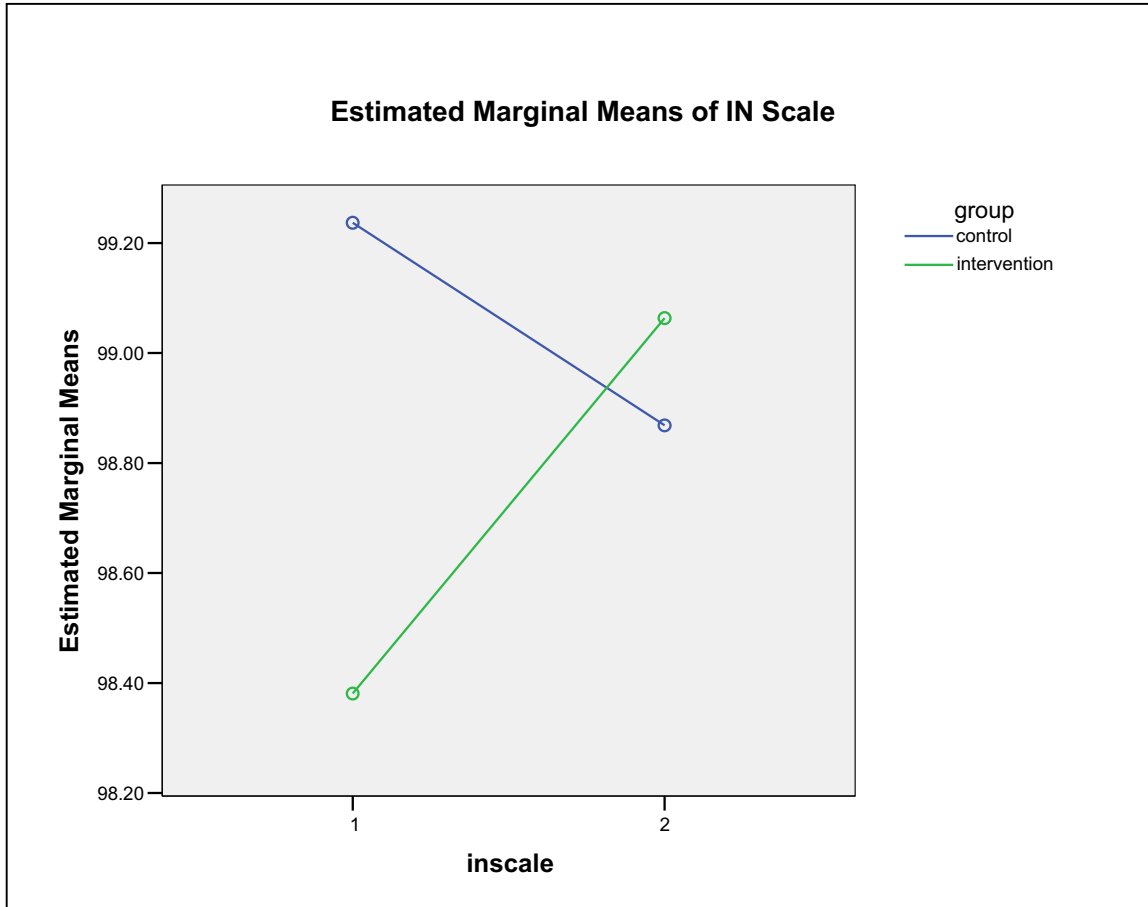
Figure 10. Estimated Marginal Means of IN Scale.

The control and intervention groups showed different patterns from pretest to posttest on the Independence scale as illustrated in Figure 10 above. This interaction $(F[1,99]=0.71, p=.40)$, indicates no statistical significance even though the control group declined in its mean while the intervention group's mean increased.

Flexibility (FL) Scale

Estimated Marginal Means of FL Scale
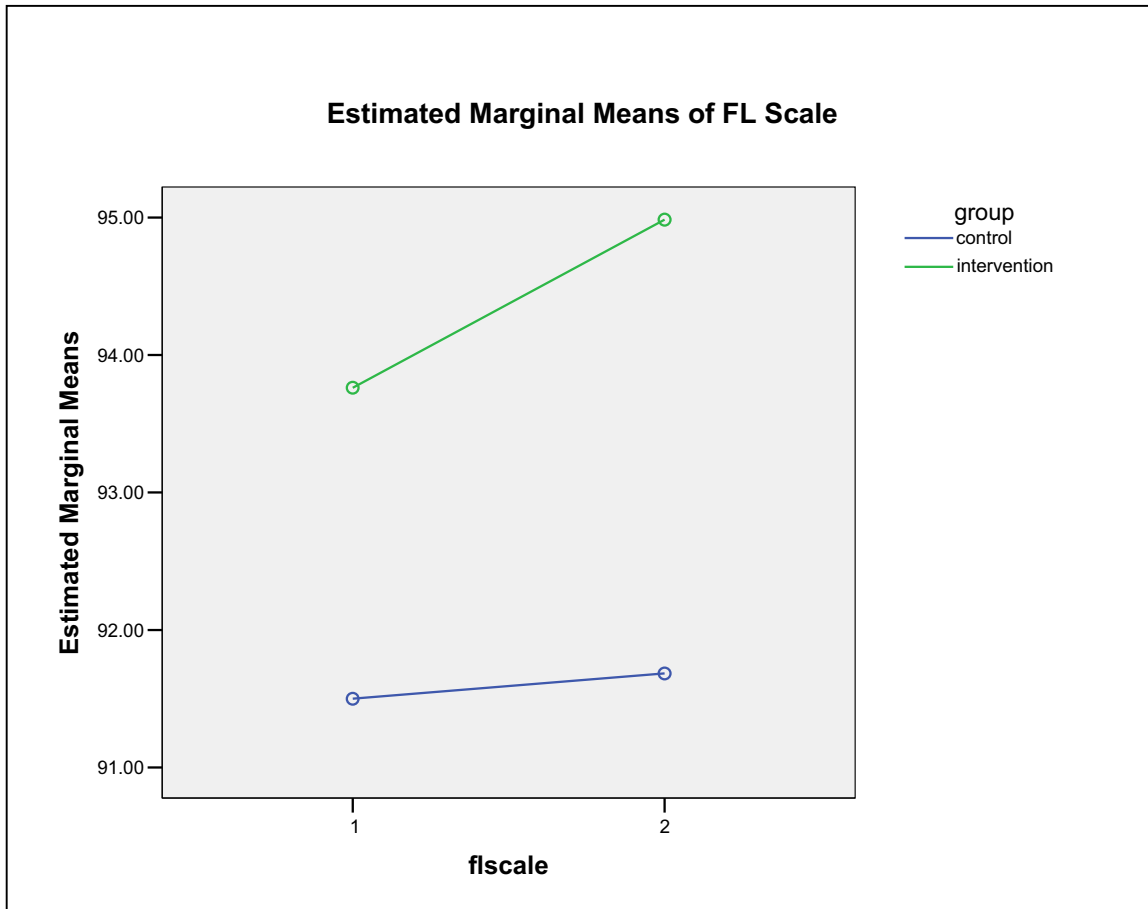
Figure 11. Estimated Marginal Means of FL Scale.

The control and intervention groups showed similar patterns from pretest to posttest on the Flexibility scale as illustrated in Figure 11 above. The interaction ($F[1,99]=0.40, p=.53$), indicates no statistical significance even as both the intervention and control groups showed an incline in mean. In this scale the intervention showed a steeper incline in it's mean scores when compared to the control.

Problem Solving (PS) Scale
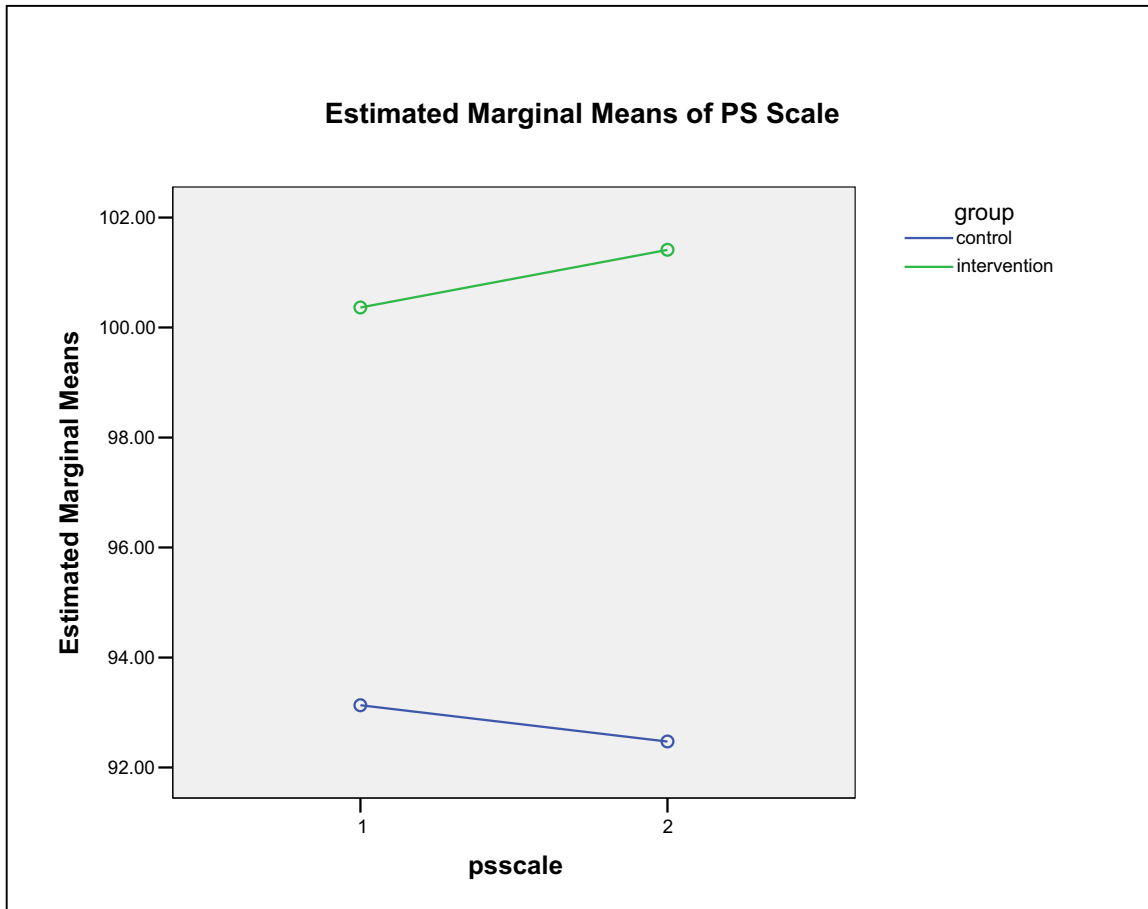
Figure 12. Estimated Marginal Means of PS Scale.

The control and intervention groups showed different patterns from pretest to posttest on the Problem Solving scale as illustrated in Figure 12 above. This interaction ($F[1,99]=0.89, p=.35$), indicates no statistical significance even though the control group declined in its mean while the intervention group's mean increased.

Impulse Control (IC) Scale
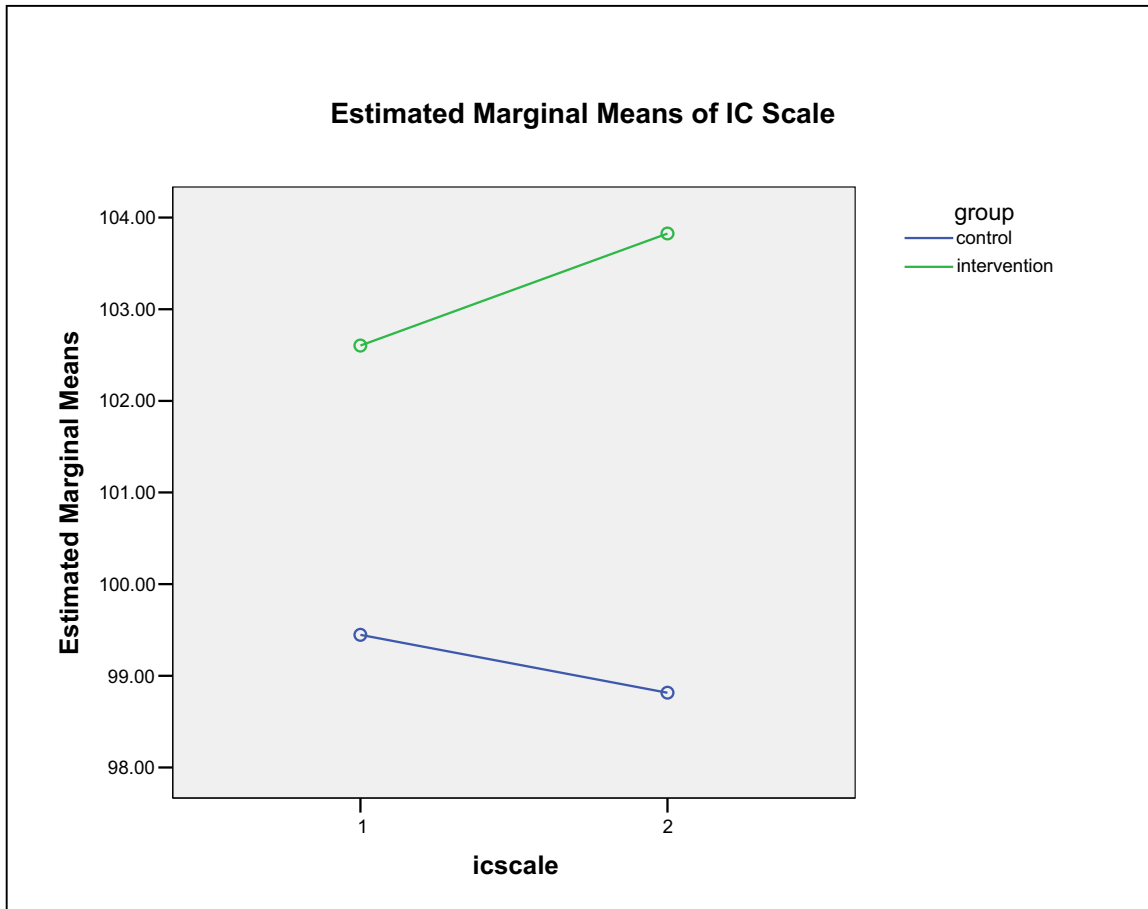
Figure 13. Estimated Marginal Means of IC Scale.

The control and intervention groups showed different patterns from pretest to posttest on the Impulse Control scale as illustrated in Figure 13 above. This interaction (F[1,99]=2.01,p=.16), indicates no statistical significance even though the control group declined in its mean while the intervention group's mean increased.

Emotional Self-Awareness (ES) Scale
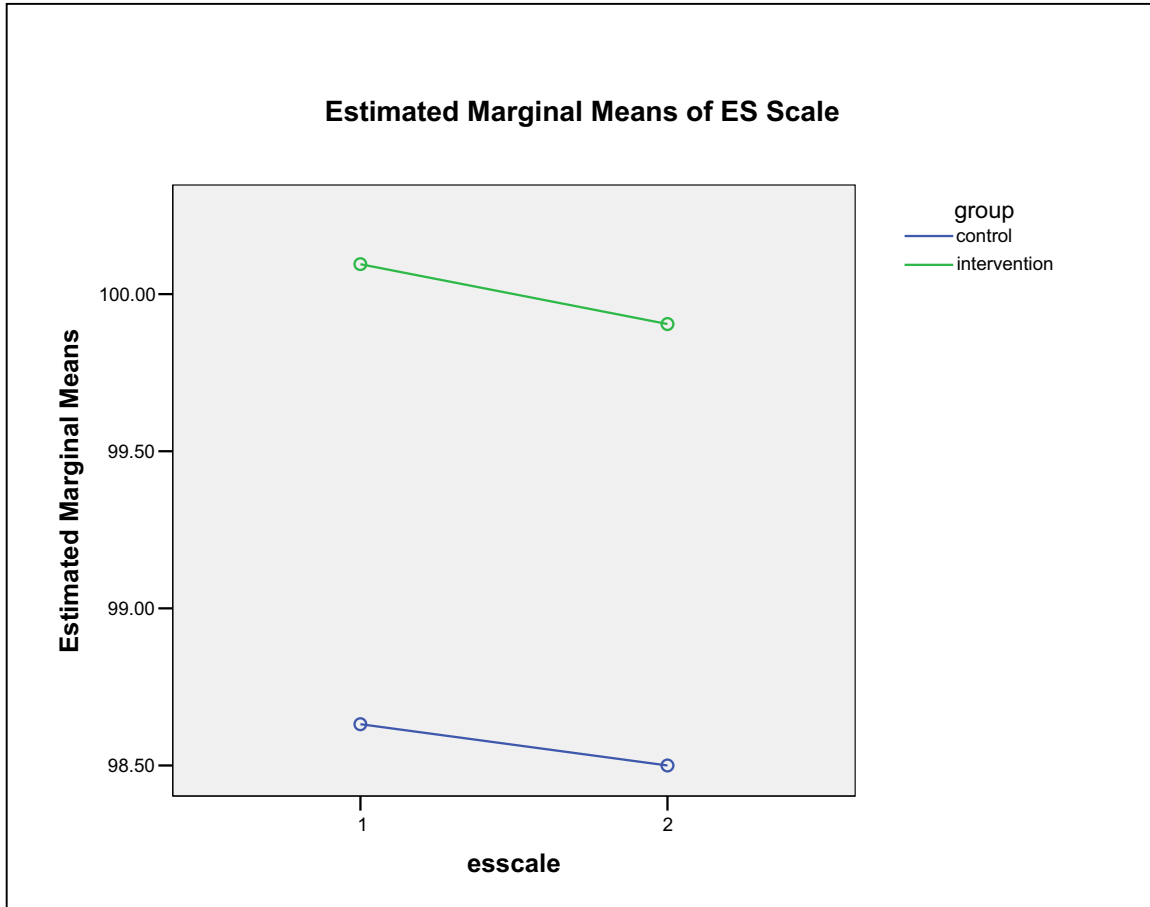
Figure 14. Estimated Marginal Means of ES Scale.

The control and intervention groups showed similar patterns from pretest to posttest on the Emotional Self Awareness scale as illustrated in Figure 14 above. The interaction (F[1,99]=0.00,p=99), indicates no statistical significance even as both the intervention and control groups showed a decline.

Assertiveness (AS) Scale

Estimated Marginal Means of AS Scale
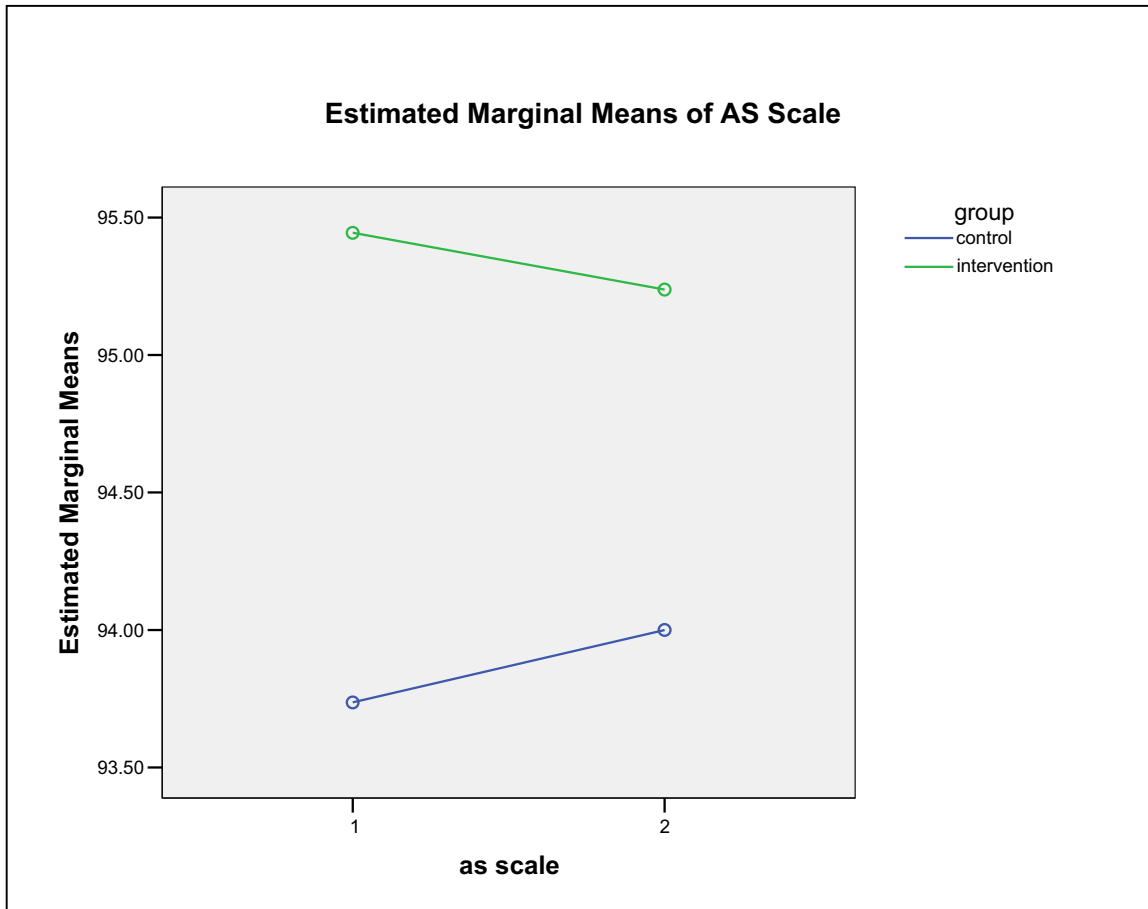
Figure 15. **Estimated Marginal Means of AS Scale.**

The control and intervention groups showed different patterns from pretest to posttest on the Assertiveness scale as illustrated in Figure 15 above. This interaction ($F[1,99]=0.013, p=.91$), indicates no statistical significance even as the intervention group showed a decline and the control group showed an incline.

Self-Actualization (SA) Scale
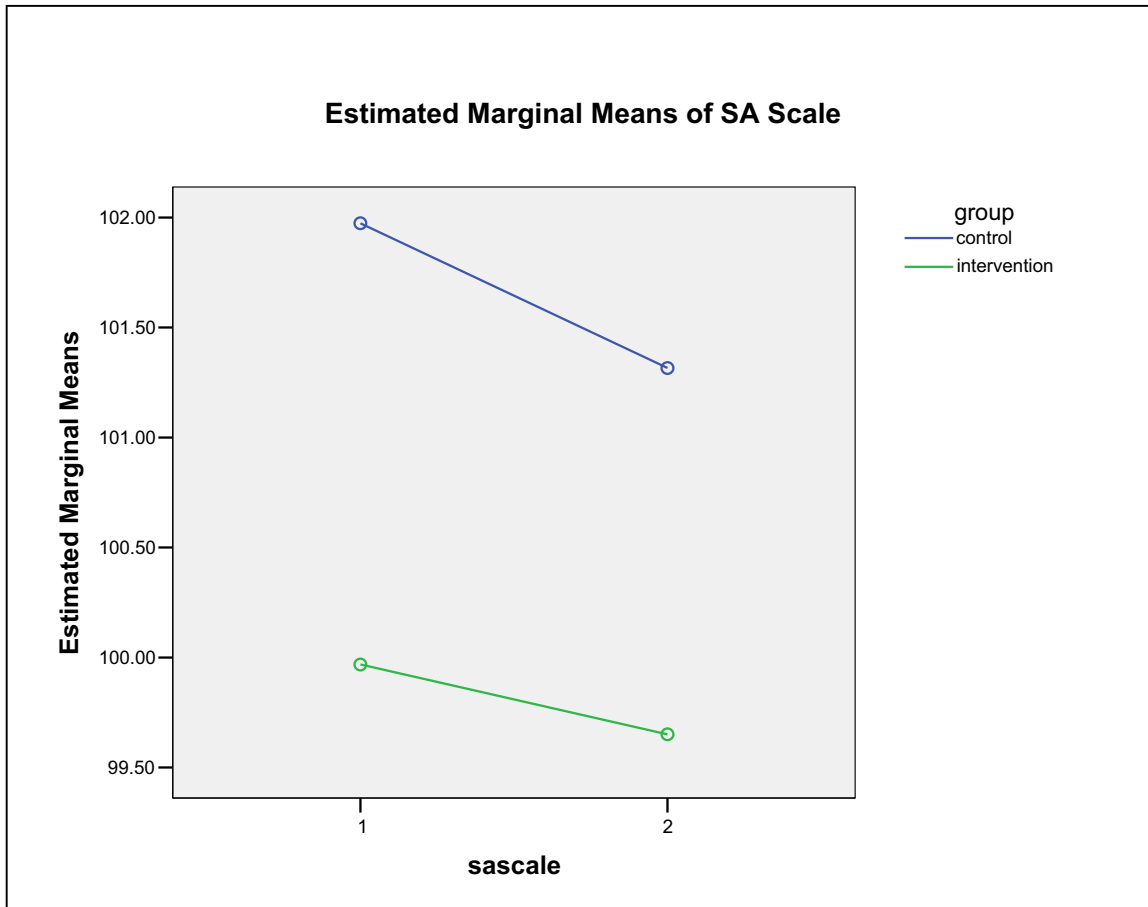
Figure 16. Estimated Marginal Means of SA Scale.

The control and intervention groups showed similar patterns from pretest to

posttest on the Self-Actualization scale as illustrated in Figure 16 above. The interaction

$(F[1,99]=0.06, p=.81)$, indicates no statistical significance even as both the intervention

and control groups showed a decline.

Empathy (EM) Scale
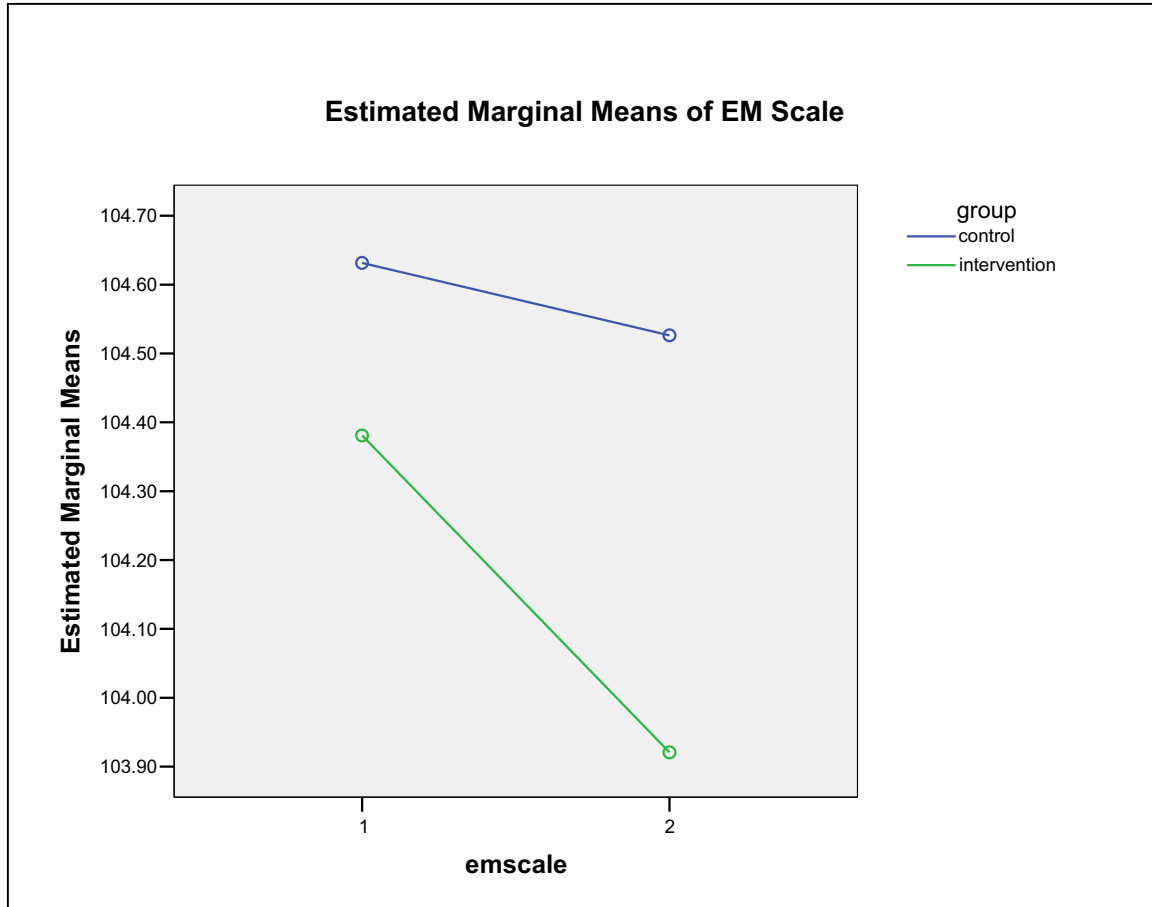
Figure 17. Estimated Marginal Means of EM Scale.

The control and intervention groups showed similar patterns from pretest to

posttest on the Empathy scale as illustrated in Figure 17 above. The interaction

$(F[1,99]=0.05,p=.82)$, indicates no statistical significance even as both the intervention

and control groups showed a decline.

Social Responsibility (RE) Scale
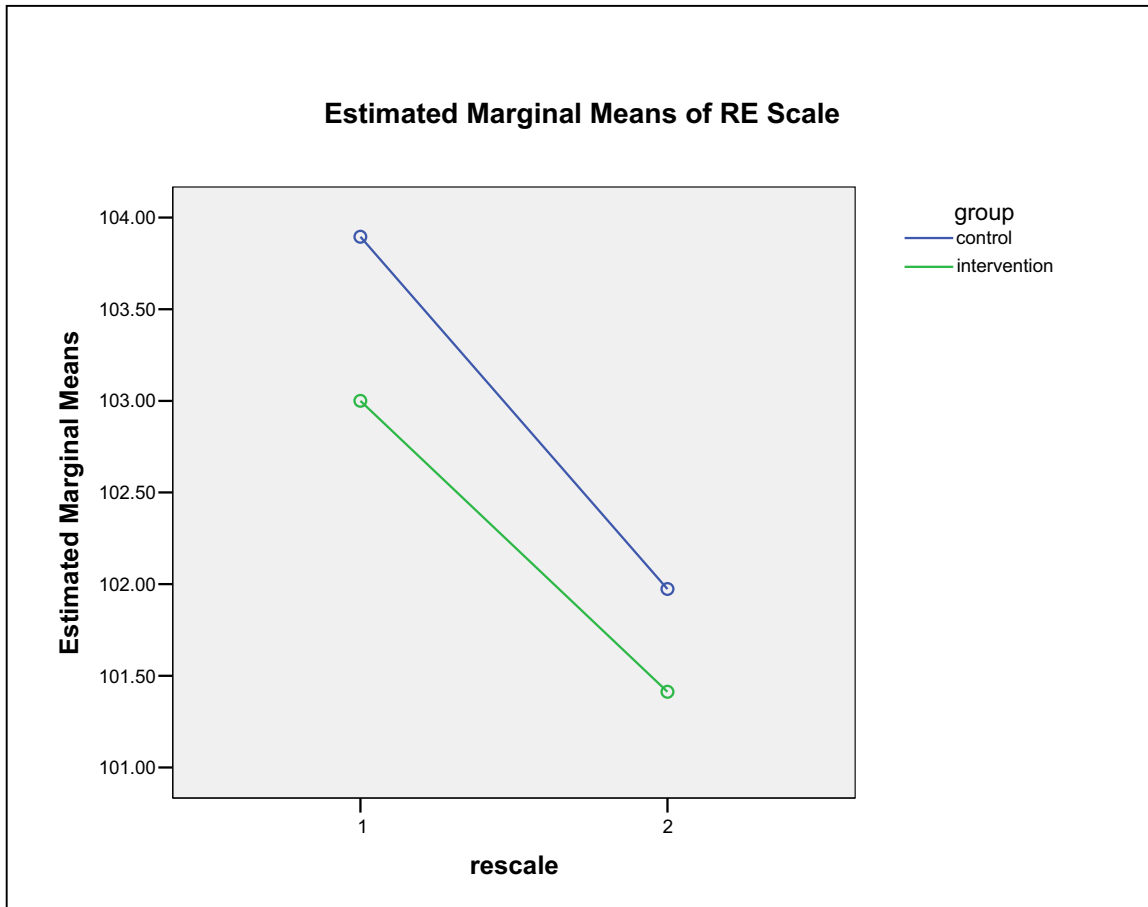
Figure 18. Estimated Marginal Means of RE Scale.

The control and intervention groups showed similar patterns from pretest to posttest on the Social Responsibility scale as illustrated in Figure 18 above. The interaction ($F[1,99]=0.06, p=.81$), indicates no statistical significance even as both the intervention and control groups showed a decline.

Optimism (OP) Scale
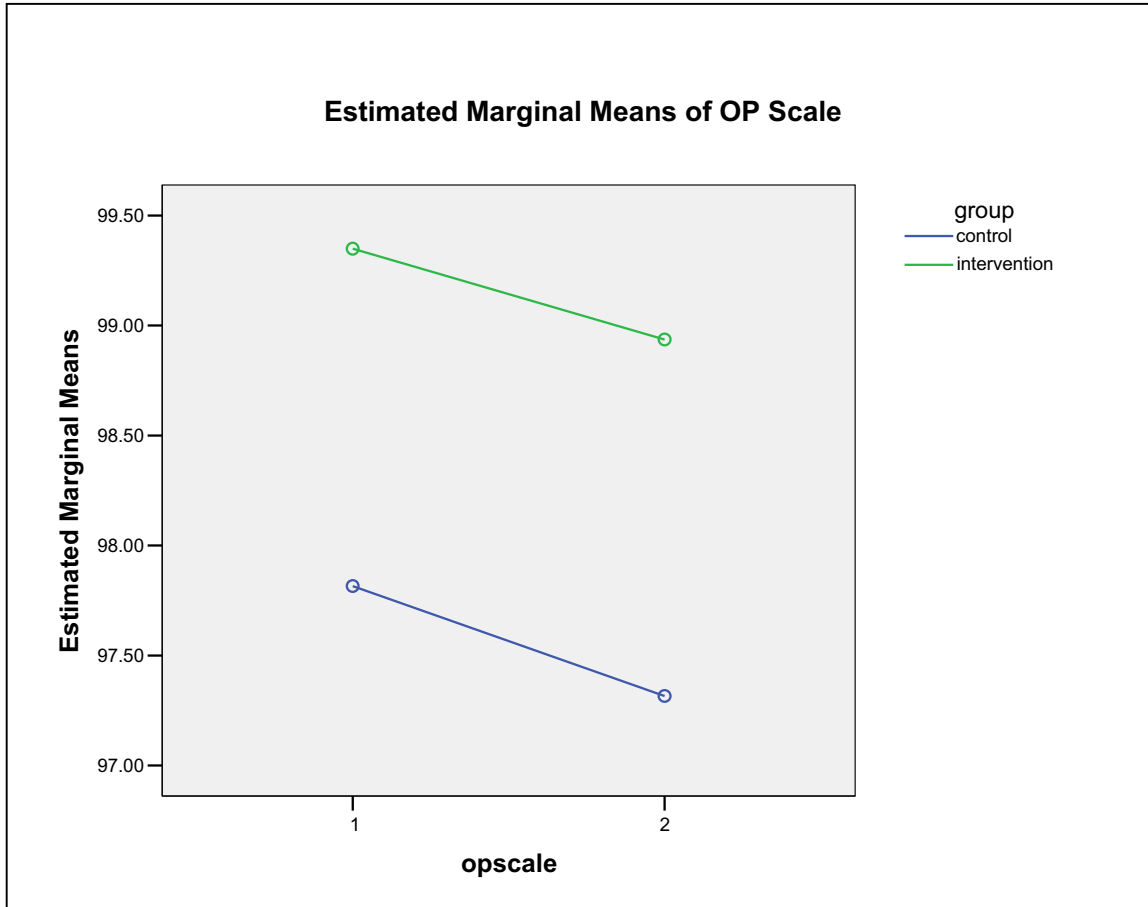
Figure 19. Estimated Marginal Means of OP Scale.

The control and intervention groups showed different patterns from pretest to

posttest on the Optimism scale as illustrated in Figure 19 above. This interaction

(F[1,99]=0.001,p=.98), indicates no statistical significance even though the control group

declined in its mean while the intervention group's mean increased.

Initial Results

The intervention and control groups had 100 percent completion for marking of answers on their EQ-i tests. No tests were thrown out. The results of this study supports the hypothesis that using the HeartMath Techniques of Heart Lock-In®, Neutral® and Freeze-Frame® does increase emotional intelligence scores. Total emotional intelligence scores had a statistical correlation of p=.001. The fifteen subscales to the BarOn Emotional Quotient Inventory Scale showed that in the intervention group, nine out of fifteen subscales increased in their mean values from pre to posttest. Three of these scales showed statistical significance while two more showed marginal statistical significance.

Secondary Analysis

Three EQ subscales and the total EQ scores, all demonstrated a statistical correlation. In addition, two more subscales demonstrated marginal statistical correlations. As noted above, some of the test subjects in the intervention group did not perform all of the intervention techniques. Because of this, the 2x2 Mixed Factorial Design calculations were only performed using data from those subjects that actually participated in that method of intervention. The findings will be further examined in the Discussion chapter.

CHAPTER 4:
CONCLUSIONS, DISCUSSION, AND SUGGESTIONS

This chapter summarizes and attempts to discuss the significance of the statistical findings of the study. It also covers limitations of this study and proposes areas for further research.

Summary

The purpose of this study was to determine if practicing HeartMath stress-reduction techniques for six weeks had an effect on emotional intelligence. The HeartMath techniques used in the study were Heart Lock-In®, Neutral® and Freeze-Frame®. The emotional intelligence model used in the study was the BarOn Emotional Quotient Inventory (EQ-i). This extensively validated multi-factorial emotional intelligence test consisted of a substructure that included a total EQ score and fifteen sub scores: Self-Regard, Emotional Self-Awareness, Assertiveness, Independence, Self-Actualization, Empathy, Social Responsibility, Interpersonal Relationship, Reality Testing, Flexibility, Problem Solving, Stress Tolerance, Impulse Control, Optimism and Happiness.

The results of this study clearly showed that practicing HeartMath techniques for six weeks statistically correlated to an increase in emotional intelligence.

Conclusions and Discussion

The intervention group consisted of 83 participants. Twenty of the participants did not practice any HeartMath technique during the study. A t-test analysis evaluating the differences between the intervention group that practiced HeartMath techniques and

the intervention group that did not showed there were two areas of statistical significance. The intervention group that did not practice HeartMath techniques scored higher on the Self-Regard and Flexibility scales on the pre-test EQ-i. Self-Regard in this emotional intelligence test is considered to be the ability to respect and accept oneself as basically good; essentially liking the way one is. It is associated with general feelings of self-confidence.[1] The Flexibility scale is identified as the ability to adjust one's emotions, thoughts and behavior to changing situations and conditions.[2]

Five participants out of the twenty offered feedback when they turned in their forms indicating why they had not practiced any of the interventions. The feedback was as follows: *"I just didn't have the time," "I forgot and just never seemed to have the time," "I never got into the swing of practicing and then I forgot all about it until I received your letter reminding me to come in for my other emotional intelligence test," "I was meaning to do the Heart Lock-In one everyday, but I always thought about it when I didn't have the time," and "Oh, I'm sorry, I just didn't have the time, but it was interesting when I learned it all."*

To practice any new change in lifestyle requires conscious thought and dedication. The impetus to change or the acknowledgement that change is important to achieve a desired outcome can play a role in motivation. Scoring statistically higher on the scales of Self-Regard and Flexibility correlates by the above definitions to essentially already liking oneself as is and therefore pursuing change does not take precedence.

Gender differences were statistically significant when comparing the intervention group to the control, (p=.001). More women than men were in the intervention group and more men than women were in the control group. This variance is important to be taken

into account when viewing the over-all results. The BarOn EQ-i is normed on a cross sample across North America, but is evenly distributed across gender. Equally important for account in variance were the average ages for both the intervention and control groups. The intervention vs. control groups carried a mean age of 51 years vs. 39 years. The intervention group also had a higher percentage of retired participants when compared to the control. As the intervention required a 7-hour day to participate, the time commitment was more conducive for those that did not need to take time off work to participate even in light of the fact the control group was offered the HeartMath training post study.

Self Regard

As mentioned above, self-regard is associated with feelings of self-adequacy, self-confidence and self-assuredness.[3] The intervention group showed statistical significance to increases in this scale. There was no change in the control group. HeartMath techniques tap into inner guidance through increasing acknowledgment of one's own intuition. These findings of increased self-regard validate the results in the research by Rein, Atkinson and McCraty,[4] when they looked at the psychological effects of compassion and anger.

Happiness

Happiness is defined as the ability to feel satisfied with one's life, to enjoy oneself and others, and to have fun[5]. The intervention group showed statistical significance to increases in this scale. The control group declined. These results are also consistent with research findings in the literature when HeartMath is used as an intervention technique.[6]

Stress Tolerance

Stress Tolerance is defined as having the capacity to choose courses of action for coping with stress by being resourceful and effective with suitable methods.[7] The intervention group showed statistically significant improvement in this area, the control group showed decline. The increased ability to deal with stressful situations by making clear decisions is consistent with McCraty, Rozman and Childres'[8] research when they used HeartMath as an intervention.

Interpersonal Relationship

Interpersonal relationship is defined as having meaningful social interchanges characterized by the ability to give and receive warmth and affection. It requires sensitivity to others.[9] The intervention group approached statistical significance with improvement in this area where the control group showed decline. This increase in interpersonal relationships corresponds to the research results by Barrios-Coplin, McCraty and Cryer, which also had marked improvements in interpersonal interactions through work relationships.[10]

Reality Testing

Reality Testing is defined as the ability to assess the correspondence between what is experienced and what objectively exists. It requires the ability to be lucid and have clarity of perception with thought processes.[11] The techniques of HeartMath encourage the participant to be present in the here and now. Focusing on reality as it exists for that person in the moment creates awareness and objectivity. In this subscale, the intervention group approached statistical significance while the control group showed decline. These increases in scores are consistent with findings in the literature. Research

conducted by McCraty, Atkinson, Rein, Barrios-Choplin, and Roxman have all had

participants in the their studies report increases in objectivity.[12]

Impulse Control

Impulse Control is defined as the ability to resist or delay an impulse, drive or

temptation to act. The intervention group showed an increase in improvement, the

control a decrease. This finding validates the results found in the literature by Tiller[13]

when HeartMath techniques were correlated to self-control and human transformation.

Flexibility and Problem Solving

Flexibility is the ability to adjust one's emotions, thoughts and behavior to

changing situations and conditions.[14] Problem Solving is the ability to identify and

define problems as well as to generate and implement potentially effective solutions.[15]

Both of these scales increased with the intervention group. These increases in scores are

consistent with findings in the literature when HeartMath techniques were used.

McCraty, Atkinson, Rein, Barrios-Choplin, and Roxman have all had participants in the

their studies report increased objectivity, flexibility in emotions and reactions and

increased ability to problem solve.[16]

Independence

Independence is the ability to be self-directed and self-controlled in one's

thinking and actions.[17] The intervention group had markedly increased scores in this area

while the control group showed a decline. The techniques of HeartMath promote self-

control through the conscious effort of placing positive emotions and appreciation in the

area around the heart. Research by Lacey and Lacey[18] has shown that the heart

influences the autonomic nervous system, which in turn affects the emotional control center located in the brain. This effect is triggered when using HeartMath techniques.

Other Scales

I had expected scores to increase in the assertiveness, emotional self-awareness and optimism scales, but they showed a decline. It is unclear why this is. Correlating the training of HeartMath techniques and depression scales may give insight. Optimism is defined as the ability to look at the brighter side of life and to maintain a positive attitude, even in the face of adversity.[19] Noting this definition from the BarOn EQi, it is likely that this scale could be addressed in more depth using a depression screening.

Conclusions

Emotional intelligence scores have been correlated with perceived success in life to a higher correlation than cognitive intelligence scores. Emotional intelligence scores have been shown to change through life experiences and planned interventions. HeartMath is one such intervention. This study has demonstrated that practicing the HeartMath stress-reduction techniques of Heart Lock-In®, Neutral®, and Freeze-Frame® over a six week period of time results in a statistical increase in emotional intelligence scores.

Limitations of Design and Study

One of the limitations of this study was the lack of randomization. While various training sessions were available, including day, evening, and weekend hours, the time commitment to attend a seven-hour intervention workshop effectively eliminated several participants who viewed this as too costly in time. As a consequence, the intervention group was weighted toward older subjects while the control group (with a much shorter

time commitment) was more appealing to younger participants (those in their twenties and thirties).

The statistically significant uneven distribution of gender is also a limiting factor. In general, norming of the EQ-i shows no differences between males and females regarding overall emotional intelligence, but there are differences for many of the factorial components of emotional intelligence. Females score higher on interpersonal skills and males are more adaptable and are better at stress management.[20] However, in this study, these correlations to the subscales were not reflected in the gender heavy groups.

It is important to address the twenty participants of the intervention group who did not practice any HeartMath techniques. Unsolicited anecdotal feedback from five of the twenty implied that the main underlying factor for non-compliance were time constraints a perceived notion that performing the interventions would take more time than they had available. It is reasonable to assume that performing the intervention requires self-motivation and is therefore a limiting factor for future compliance.

The simple checklist used to record the number of times HeartMath techniques were practiced could have contributed to faulty (incomplete and/or inaccurate) reporting, potentially contributing to a weakness of the study. Incorporating some form of a journaling process during the six-week study might have increased the accuracy and completeness of the reporting.

Subject population size is also a limiting factor. Uneven numbers in control and intervention groups can be accounted for statistically, but as the number of subjects in each of the groups decreases, this correction factor is less valid. In addition, smaller

numbers in both groups make the ability to generalize the results of this study to the population at large less reliable.

Suggestions for Future Research

HeartMath tools are easy to learn and implement when one is motivated. The intervention training in this study includes approximately five hours of classroom instruction and, when breaks and lunch are accounted for, requires a seven- hour period to complete. A portion of this training addresses the scientific research associated with HeartMath. It is likely that more people would have performed the intervention training (and subsequently use the techniques) if the training itself had been less invasive on their personal and professional lives. Conceivably, one could eliminate the background research and just teach the HeartMath techniques, drastically decreasing the training time to approximately two to three hours. While teaching a condensed version of intervention training is not a practice currently endorsed by HeartMath, it should be considered. Future research should measure the statistical significance of abbreviated versus full training on emotional intelligence scores. With the potential to reach more people, such data could be used to create more effective training programs in the future.

Although demographic data was taken for this study, the size of the subject populations and time involved in processing the data precluded detailed statistical correlation of these factors with changes in emotional intelligence resulting from the HeartMath techniques. Future studies should examine the potential influence of other social influences such as number of hours worked per week, personal relationship status, and educational background might have on attempts to increase emotional intelligence

scores through the use of HeartMath intervention techniques. Such data could also

materially contribute to more effective training programs in the future.

The timeframe for this testing was, by necessity, relatively short. Measuring

emotional intelligence scores after six and twelve months of using HeartMath techniques

would provide much-needed and potentially quite interesting data on the long-term

effects of the HeartMath techniques on emotional intelligence.

Chapter 4 Endnotes:

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[1] Ibid., 15-18.

[2] Ibid., 15-18.

[3] Ibid., 15-18

[4] Rein, G., Atkinson, M., and McCraty,R., "The physiological and psychological effects of compassion and anger," *Journal of Advancement in Medicine*, 8(2)1995.

[5] Bar-On, 18.

[6] McCraty, 1999, 1997, 1995.

[7] Bar-On, 18.

[8] McCraty, R., Rozman, D., and Childre, D., eds., *HeartMath: A New Biobehavioral Intervention for Increasing Health and Personal Effectiveness*. Amsterdam: Harwood Academic Publishers, 1999.

[9] Bar-On, 18.

[10] Barrios-Coplin, G., McCraty, R., and Cryer, B., "A New Approach to Reduicng Stress and Improving Physical and Emotional Well Being at Work." *Stress Medicine*. 13(1997).

[11] Bar-On, 16.

[12] McCraty, 1995, 1997, 1999.

[13] Tiller, W.A. *Science and Human Transformation*. Walnut Creek, CA: Pavior Publishing, 1997.

[14] Ibid., 15-18.

[15] Ibid. 17.

[16] McCraty, 1999, 1997, 1995.

[17] Bar-On, 17.

[18] Lacey, J, and Lacey, B. "Some Autonomic Central Nervous System Interelationships" In: Black, P., *Physiological Correlates of Emotion*. (New York: Academic Press, 1970).

[19] Bar-On, 17.

[20] Ibid., 81.

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APPENDIX A
Research Study Fact Sheet for Test Subjects

Doctoral Dissertation Research Study
The Effects of HeartMath Techniques on Emotional Intelligence

HeartMath is a series of techniques, working with a form of neurologically mediated feedback between the heart and the brain. HeartMath refers to this as the intelligence of the heart. The HeartMath program teaches participants how to apply emotional self-management techniques during stressful events. Research shows when the intelligence of the heart is activated through the management of the mind and emotions, the effect creates energy efficiency, increased coherence, enhanced awareness and greater productivity.

Emotional Intelligence is defined as *an array of non-cognitive capabilities, competencies, and skills that influence one's ability to succeed in coping with environmental demands and pressures.* Emotional intelligence is a factor in determining one's ability to succeed in life.

Emotional intelligence can be changed. The hypothesis of this study is based upon the belief that the practice of HeartMath techniques for six weeks will statistically significantly increase emotional intelligence scores.

To participate in the intervention portion of this research study, you will take the Bar-On Emotional Quotient Inventory (EQ-i), followed by a six-hour training class to learn and apply HeartMath techniques. You will keep a daily record for six weeks, recording the use of the HeartMath techniques. Six weeks post training; you will complete a second Bar-On EQi test.

In appreciation for your time and dedication in this study, you will receive the HeartMath workbook and HeartMath music CD, courtesy of the HeartMath Institute. You will also receive a comprehensive individual resource report, which serves as an interpretive aid in understanding your personal EQi scores. This resource report is generated by Multi-Health System, Inc., the owners and distributors of the Bar-On Emotional Quotient Inventory (EQ-i).

Participants in the control group will complete the Bar-On Emotional Quotient Inventory twice. Once at the beginning of the study, and a second time six weeks later. Upon completion of the study, all control group participants will receive their own comprehensive individual resource report based upon their personal EQ-i scores.

Non-eligibility:

Must be 20 years or older and have no prior participation in a HeartMath training session.

APPENDIX B
Demographic Data Sheet

Demographic Data
Dissertation Study: HeartMath/Emotional Intelligence/Depression

What is your gender?
- ❑ Male
- ❑ Female

What is your marital status?
- ❑ Single
- ❑ Married
- ❑ Partnered
- ❑ Separated
- ❑ Divorced
- ❑ Widowed

How old are you?
- ❑ 20-29
- ❑ 30-39
- ❑ 40-49
- ❑ 50-59
- ❑ 60-69
- ❑ 70-79
- ❑ Over 70

What is your highest level of education? (fill in one only)
- ❑ Elementary
- ❑ Junior/Middle School
- ❑ High School
- ❑ Technical School
- ❑ Some College/Associate's Degree
- ❑ Bachelor's Degree
- ❑ Some Graduate
- ❑ Master's Degree
- ❑ Doctorate Degree

Which of the following best describes your employment status? (fill in one only)
- ❑ Student
- ❑ Laborer
- ❑ Skilled or Clerical
- ❑ Management
- ❑ Professional
- ❑ Executive
- ❑ Engineer/Technical
- ❑ Retired
- ❑ Unemployed
- ❑ Other

How many hours/week do you usually work?
- ﻕ Less than 25 hours
- ﻕ 26-35 hours
- ﻕ 36-40
- ﻕ 41-50
- ﻕ 51-59
- ﻕ 60 or more hours

APPENDIX C
Informed Consent Forms

Informed Consent for Bar-On Results

Bar-On Emotional Quotient Inventory
Information and Consent Form

For all participants in the research project measuring
The Effect of HeartMath Tools on Emotional Intelligence and the Zung Self-Rating
Depression Inventory Scale

I understand the principal investigator in this study will only receive group reports of the Bar-On Emotional Quotient Inventory, unless a signed consent form is received.

I understand if I would like my personal copy, showing my individual resource report of the Bar-On Emotional Quotient Inventory (EQ-i), I need to sign this consent form granting the principal investigator permission to receive and then release the report in my care. I will provide a written address label with the address I wish to have my report sent to.

I understand this consent form, requesting a personal resource report must be signed before I take my first EQ-i in order to insure individual report availability. If this form is not signed prior to it's scoring, only group data will be available for my review.

Confidentiality
I understand my results (test protocol and reports) are viewed only by those responsible for their preparation (Multi-Health Systems, Inc.). All information is regarded as confidential. A copy of my report will not be kept after July 1, 2004. At this time all identifying information will be deleted.

I understand if I wish to have a personal 1-on-1 coaching session with a trained EQ-I trainer/coach, I will need to sign a separate consent form releasing my personal EQ-i information to the trainer/coach.

Name of Participant _____
 (Please print)

Participant Signature _____ Date: _____

Witness to Signature _____ Date: _____

Informed Consent Form for Control Group (Revised)

Page 1

Informed Consent Form
Control Group

Protocol Researching:
**The Effect of HeartMath Tools on Emotional Intelligence and the
Zung Self-Rating Depression Inventory Scale**

Purpose of the study
I understand the purpose of this study is to observe the effect HeartMath Tools have on emotional intelligence scores and on the Zung Self-Rating Depression Inventory Scale. The primary hypothesis of this study is based upon the belief that the practice of HeartMath techniques for six weeks will statistically significantly increase emotional intelligence scores. Emotional intelligence is a determining factor in one's ability to succeed in life.

Who is eligible to be in the study?
I am eligible to participate in this study because I am at least twenty (20) years of age and have had no previous training in HeartMath techniques.

Procedures
If I agree to be in this study, I will participate in the control group where I will be taking the Zung Self-Rating Depression Inventory Scale and the Bar-On Emotional Quotient Inventory (Emotional Intelligence Test) twice with a six-week lapse between. I understand together these tests take around 35 minutes to complete.

I understand after completing the second emotional intelligence test, I have the option to be given a comprehensive resource report from my original emotional intelligence test, taken at the beginning of the study. Multi-Health system, Inc., the owners and distributors of the Bar-On emotional Quotient Inventory generate this comprehensive report.

Risks and Discomforts
I understand the risks of participating in this study are minimal, i.e. no greater than in ordinary life.

If my score on the Zung Depression Inventory Scale indicates moderate to severe depression, I will receive a personal phone call from the principal investigator who will provide a list of community numbers for counseling.

Benefits
I will receive no personal benefit from participating in this study.

Informed Consent Form for Control Group (Revised)

Page 2

Questionnaires/Paperwork
I will take the Zung Self-Rating Depression Scale and the Bar-On Emotional Quotient Inventory two times, with a six-week lapse.

Confidentiality
I understand all questionnaires related to this study will be kept in a confidential file at the Multi-Health Systems, Inc. in Toronto, Canada. Multi-Health Systems, Inc. will only keep questionnaires until July 1, 2004, and then all paper will be properly shredded and all electronic data deleted. Only group data will be given to the primary investigator. Only group data will be used in published results or presentations. If I wish to have access to my personal EQ-i results, along with a resource report generated by Multi-Health Systems, Inc., then I understand I will sign a written permission form, separate from the Consent form needed to participate in this study. This separate permission form must be signed at the time of completing my first Bar-On Emotional Quotient Inventory Scale (emotional intelligence test). I understand all Zung Depression Scale questionnaires related to this study will be kept confidential in a locked cabinet in the Congregational Nurse Department of Memorial Hospital. I will be asked to provide the last four digits of my Social Security number as an identifying number in order to match the scores from each of the two times I take the self-rating scale. I understand that the person responsible for the data analysis does not have access to identifying information. The last four digits of the Social Security numbers make the surveys anonymous to the data analyst. I understand only group data will be used in published results or presentations.

Costs
I understand there is no cost to me if I choose to participate in the study. The primary investigator is covering the cost of all emotional intelligence and depression testing. I will receive no payment for participation in this study.

Voluntary Participation
I understand I am under no obligation to participate in this study and may withdraw from the study at any time without penalty.

Request For Information
This study has been explained to me and the opportunity to ask questions has been given. If any other questions should come up during the study I can contact Sara Hake at Memorial Hospital (284-6516). If I have questions about my rights as a research participant I can call Jan Howard at the Memorial Institutional Review board (284-3221).

Informed Consent Form for Control Group (Revised)

Page 3

Injury Statement

An injury resulting from this type of study is very unlikely. But if an injury does occur, staff from Memorial Hospital will be available to attend.

I confirm that an investigator has explained to me the purpose of this research study and the possible risks or discomforts. I understand the possible benefits of participating in the control group. I understand that I will be taking the Zung Self-Rating Depression Inventory Scale and the Bar-On Emotional Quotient Inventory twice. I have read and understand this consent form and have had all my questions answered to my satisfaction. I have received a copy of this consent form. Therefore, I agree to give my consent to participate as a participant in this research project.

Name of Participant _____
   (Please print)

Participant Signature _____Date: _____

Witness to Signature _____Date: _____

Informed Consent Form for Intervention Group (Revised)

Page 1

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Informed Consent Form
Intervention Group

Protocol Researching:
**The Effect of HeartMath Tools on Emotional Intelligence and the
Zung Self-Rating Depression Inventory Scale**

Purpose of the study
I understand the purpose of this study is for me to learn a set of holistic emotional self-management tools called HeartMath. The specific tools I will be learning are: freeze frame, neutral, and Heart Lock-In. HeartMath techniques are quick, simple to learn, and easy to put into practice. I understand this is a doctoral research study that is looking at the effect HeartMath tools have on emotional intelligence and the Zung Self-Rating Depression Inventory Scale.

Who is eligible to be in the study?
I am eligible to participate in this study because I am at least twenty (20) years of age and have had no previous training in HeartMath techniques.

Procedures
If I agree to be in this study, I will participate in a six-hour workshop where I will be taking the Zung Self-Rating Depression Inventory Scale and the Bar-On Emotional Quotient Inventory (Emotional Intelligence Test). I will learn the concepts and skills of emotional self-management as developed by the Institute of HeartMath. I will be taught the techniques of Freeze Frame, Neutral and Heart Lock-in, which are techniques of stress management that I can easily learn and then practice on my own. One optional technique I can choose to do during class involves the use of a computer program that monitors heart rate variability through an electronic sensor lightly attached to my finger. Following the six-hour workshop, I will daily practice Heart Lock-in for six weeks, a minimum of ten minutes daily. I will use a check mark system, provided through the workshop, to record how often I use any HeartMath technique taught to me during the workshop. At the end of six weeks I will complete another Zung Depression Inventory Scale and Bar-On Emotional Quotient Inventory (Emotional Intelligence Test). I understand together these tests take around 35 minutes to complete.

Risks and Discomforts
I understand the risks of participating in this study are minimal, i.e. no greater than in ordinary life. It is possible that I may feel some mild anxiety related to stressful situations that I recall during the training. The HeartMath techniques are non-invasive. The optional computer program that is used in the workshop does make use of a finger sensor that is lightly attached to my finger.

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Informed Consent Form for Intervention Group (Revised)

Page 2

If my score on the Zung Depression Inventory Scale indicates moderate to severe depression, I will receive a personal phone call from the principal investigator who will provide a list of community numbers for counseling.

Questionnaires/Paperwork
I will take the Zung Self-Rating Depression Scale and the Bar-On Emotional Quotient Inventory two times, with a six-week lapse. For six weeks I will keep a daily checklist recording the number of times I used any HeartMath technique learned in the workshop. For six weeks I will practice the Heart Lock-in technique for a minimum of 10 minutes daily.

Benefits
It is possible that when I learn and practice the HeartMath techniques of emotional self-management, I will benefit from reduced stress, possible increased emotional intelligence scores and a possible increase in emotional self-management.

Confidentiality
I understand all questionnaires related to this study will be kept in a confidential file at the Multi-Health Systems, Inc. in Toronto, Canada. Multi-Health Systems, Inc. will only keep questionnaires until July 1, 2004, and then all paper will be properly shredded and all electronic data deleted. Only group data will be given to the primary investigator. Only group data will be used in published results or presentations. If I wish to have access to my personal EQ-i results, along with a resource report generated by Multi-Health Systems, Inc., then I understand I will sign a written permission form, separate from the Consent form needed to participate in this study. This separate permission form must be signed on the day of the workshop. I understand all Zung Depression Scale questionnaires related to this study will be kept confidential in a locked cabinet in the Congregational Nurse Department of Memorial Hospital. I will be asked to provide the last four digits of my Social Security number as an identifying number in order to match the scores from each of the two times I take the self-rating scale. I understand that the person responsible for the data analysis does not have access to identifying information for the last four digits of Social Security numbers make the surveys anonymous to the data analyst. I understand only group data will be used in published results or presentations.

Costs
I understand there is no cost to me if I choose to participate in the study. If I am a Memorial Hospital employee I will request permission from my unit director. I understand Memorial Hospital covers the cost of $60/employee for HeartMath books. The primary investigator is covering the cost of all emotional intelligence and depression testing. I will receive no payment for participation in this study.

Informed Consent Form for Intervention Group (Revised)

Page 3

Voluntary Participation
I understand I am under no obligation to participate in this study and may withdraw from the study at any time without penalty.

Request For Information
This study has been explained to me and the opportunity to ask questions has been given. If any other questions should come up during the study I can contact Sara Hake at Memorial Hospital (284-6516). If I have questions about my rights as a research participant I can call Jan Howard at the Memorial Institutional Review board (284-3221).

Injury Statement
I understand an injury resulting from this type of study is very unlikely. But if an injury does occur, staff from Memorial Hospital will be available to attend.

I confirm that an investigator has explained to me the purpose of this research study and the possible risks or discomforts. I understand the possible benefits of participating. I understand that I will be taught several stress management tools and will be taking the Zung Self-Rating Depression Inventory Scale and the Bar-On Emotional Quotient Inventory twice. I have read and understand this consent form and have had all my questions answered to my satisfaction. I have received a copy of this consent form. Therefore, I agree to give my consent to participate as a participant in this research project.

Name of Participant _____
  (Please print)

Participant Signature _____Date: _____

Witness to Signature _____Date: _____

APPENDIX D
IRB Memorial Hospital Protocol Submission Form

Page 1

**IRB Memorial Hospital
Protocol Submission Form**

Title: The Effect of HeartMath Tools on Emotional
                                                    Intelligence and the Zung Depression Inventory
                                                    Scale

Principal Investigator: Sara Hake B.S.N., R.N., M.Ed

Collaborating Investigators: Neil L. Gilbert, M.A., M.S.W., L.C.S.W.
                                                    George Soper Ph.D.
                                                    Deborah Drendall

Mailing Address: Sara Hake
                                                    Memorial Hospital
                                                    South Bend, IN. 46624
                                                    Shake@memorial.org

Phone: 219-284-6516 (work)

Date: _____   Signature: _____

Approval of Department Head _____ Date _____

Date of IRB Approval: _____

Signature of IRB Chair: _____

Period of Approval: _____

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1. Background:
HeartMath is a series of techniques, working with a form of neurologically mediated feedback between the heart and the brain. HeartMath refers to this as the intelligence of the heart. The HeartMath program teaches participants how to apply emotional self-management techniques during stressful events. Research shows when the intelligence of the heart is activated through the management of the mind and emotions, the effect creates energy efficiency, increased coherence, enhanced awareness and greater productivity.

Emotional Intelligence is defined as *an array of non-cognitive capabilities, competencies, and skills that influence one's ability to succeed in coping with environmental demands and pressures.* Emotional intelligence is a factor in determining one's ability to succeed in life.

Emotional intelligence can be changed. The hypothesis of this study is based upon the belief that the practice of HeartMath techniques for six weeks will statistically significantly increase emotional intelligence scores. The secondary hypothesis is based upon the belief that the practice of HeartMath techniques for six weeks will decrease scores on the Zung Depression Inventory Scale. Lower scores on the Zung Depression Inventory Scale are indicative of fewer signs and symptoms of depression.

HeartMath training sessions have been taught at Memorial Hospital for the past two years. The HeartMath training session in this study is the exact same protocol and material currently taught during a six-hour session at Memorial Hospital. The emotional intelligence test, called the Bar-On Emotional Quotient Inventory (EQ-i), is the same test currently in use by George Soper and Deborah Drendall at Memorial Hospital. The EQ-i has been used at Memorial for the past twelve months.

There are no current literature studies found showing the effects of using HeartMath tools on a standardized (reliability and validity) emotional intelligence test. There are no current literature studies found showing the effects of using HeartMath tools on the standardized Zung Depression Inventory Scale. Currently Memorial Hospital measures perceived differences in stress levels three weeks post training of a HeartMath teaching session.

2. Purpose:
The purpose of this study is to see if Emotional Intelligence and depression scores can be changed with the use of HeartMath techniques. The primary hypothesis of this study is based upon the belief that the practice of HeartMath techniques for six weeks will statistically significantly change emotional intelligence scores. Emotional intelligence is a determining factor in one's ability to succeed in life. HeartMath techniques are quick, simple to learn, and easy to put into practice. A successful

statistical outcome for this study will help provide future training programs with techniques to increase emotional intelligence scores. The secondary hypothesis of this study is the belief that the practice of HeartMath techniques for six weeks will decrease over-all scores on the Zung Depression Inventory Scale.

3. Setting:
Three locations are currently reserved for training sessions:
Little Flower Catholic Church, Ironwood Street, South Bend, Indiana,
Commerce Center, Colfax Street, South Bend, Indiana, and the
Leighton Center, Michigan Street, South Bend, Indiana.

4. Subjects:
150 subjects will be recruited. Approximately fifty percent of the subjects will be Memorial Hospital employees. Fifty percent of the subjects will be recruited from the community. From the total of 150 subjects, one hundred will be in the intervention group; fifty will be in the control group. The sample is self-selected for the intervention or control groups. If recruitment exceeds 100 subjects (intervention group), or 50 subjects (control group), random selection will take place. All Memorial employees will have the opportunity to participate in future HeartMath training sessions as well as emotional intelligence testing if they are not selected for this study.

All subjects must be age 20 or older and have no prior HeartMath training.

5. Methodology:
The principal investigator will provide information about HeartMath training, the Zung Depression Inventory Scale, and Emotional Intelligence testing using the EQ-i. Memorial employees will call the Nursing Administration HeartMath coordinator or the principal investigator to sign up for the research study. Logistical questions including the nature of the training and time commitment may be addressed at the time of registration. The Principal Investigator for this study will obtain informed consent from each subject at the time of the workshop, prior to completion of the initial emotional intelligence questionnaire. At that time information will be provided about the purpose of the study, about HeartMath, Emotional Intelligence, possible benefit, minimal risk, and the option to withdraw from the study at any time. Informed consent will be requested at that time.

The intervention group has eight sessions scheduled for training. They will choose one session to attend. Each session will be six hours in length. The pre-intervention EQ-i test and Zung Depression Survey will be given at the start of the session. Six weeks post training a second EQ-i test and a second Zung Depression Survey will be administered. Times available to sign up for post testing will be available at the time initial testing is scheduled. All participants will select a date for post-testing with the primary investigator.

Dates of Training
HeartMath, Depression, and Emotional Intelligence Research Study

April 14 (Wednesday)	8:30-3:30
April 17 (Saturday)	8:30-3:30
April 20 (Tues & Thurs)	6:30-9:30 p.m.
April 22	
April 21 (Wednesday)	8:30-3:30
April 23 (Friday)	8:30-3:30
April 24 (Saturday)	8:30-3:30
April 26 (Mon. & Wed)	6:30-9:30 p.m.
April 28	
April 27 (Tuesday)	8:30-3:30

Control group will complete two EQ-i tests and two Zung Depression Inventory Scales, six weeks apart. These tests can be taken on their own time, scheduled with the Principal Investigator.

All participants (intervention and control) will have access to one on one personal coaching regarding their own emotional intelligence scores upon completion of the study. The coaches are all certified in administration and coaching for the EQ-I test. The certified coaches are George Soper, Ph.D., Vice President, Memorial Hospital, Deborah Drendall, BME/BA, M.M., Organization Effectiveness, Memorial Hospital, and the Principal Investigator in this study, Sara Hake, B.S.N., R.N., M.Ed, doctoral student, Manager of Congregational Nursing, Memorial Hospital.

Experimental Procedure
Subjects will be taught five techniques of stress management. The principal technique, called Freeze Frame is a five-step process of emotional self-management. It teaches a) stopping a stressful reaction; b) shifting attention to the area around the heart and imagining breathing through the heart; c) recalling a positive feeling or time and reliving the experience; d) sincerely asking one's heart for a better solution to the stressful situation; e) listening to what the heart says.

Two of the other techniques, Neutral and Heart Lock-in are variations of the Freeze Frame technique and use some of the above steps. There is also a communications technique called Intuitive Listening that teaches how to listen at a level for deep meaning. There is also teaching of a computer program that monitors heart rate variability through an electronic finger sensor.

All of these techniques will be taught at the initial daylong workshop for the intervention group.

Description of the Tools
There are three techniques of HeartMath, which will be taught during the class, and records kept on frequency of their use for the following six weeks. These techniques are 1) Freeze Frame, 2) Neutral and, 3) Heart Lock-In. Freeze Frame is a tool, which requires one minute to complete. Neutral is a tool requiring three to five seconds to complete, and Heart Lock-In is a tool requiring ten to seventeen minutes to complete.

Outcome Measure:
The principal outcome measure is change in emotional intelligence scores. The Bar-On Emotional Quotient Inventory Scale is subdivided into five composite categories measuring, 1) Intrapersonal Emotional Quotient Scale, 2) Interpersonal Emotional Quotient Scale, 3) Stress Management Emotional Quotient Scale, 4) Adaptability Emotional Quotient Scale, and 5) General Mood Emotional Quotient Scale. It has fifteen content subscales and four validity indicators built in. There are 133 questions, which identify key determinants of success. These questions are answered on a 5-point scale from "Very Seldom True or Not True of Me" to "Very Often True or True of Me." It takes approximately 30 minutes to complete the test. Standard scores are based on a mean of 100 and standard deviation of 15. This standardized test is extensively normed across cultures (>10,000). Test-retest reliability is >.6 at four months. Cronbach's alpha is .75 to .89. All tests are scored at Multi-Health Systems, Inc., the owners and distributors of the Bar-On Emotional Quotient Inventory (EQ-i). This outcome measure relates to the first hypothesis. A pre and post Bar-On Emotional Quotient Inventory Scale will be taken with a six-week interval. Scores on all five composite and all fifteen content subscales will be compared pre and post intervention.

The second outcome measure relates to the second hypothesis in this study. Total scores of the pre and post test Zung Self-rating Depression scales will be statistically compared. The Zung Self-rating Depression Scale has 20 items. These items are in the following 4 quantitative terms: a little of the time, some of the time, good part of the time, or most of the time. A value of 1,2,3, and 4 is assigned to a response depending upon whether the item is worded positively or negatively—the less depressed patients and his complaint have a low score and the more depressed patients and his complaints have a higher score. Over-all raw scores are multiplied by 100 for a maximum score of 80. 70 and over means a presence of severe to most extreme depression. 60-69 means a presence of moderate to marked depression. 50-59 means a presence of minimal to mild depression. A score below 50 means within normal range, no psychopathology.

For six weeks all intervention participants will practice the Heart Lock-in technique for 10 minutes daily. They will record on paper, via check mark, how often HeartMath techniques were used throughout the day. Emotional Intelligence group scores will be compared pre and post six weeks and correlated with the practice of using HeartMath techniques. Zung Depression Inventory scores will be compared pre and post six weeks. Attached is a copy of the chart used to record the frequency of HeartMath techniques.

6. Possible Risks:

The risks are considered minimal, i.e. no greater than in ordinary life. It is possible that subjects may feel some mild anxiety related to stressful situations they recall during the training. The HeartMath techniques are non-invasive. The computer program does make use of a finger sensor that is lightly attached to one's finger.

A score of 60-69 on the Zung Depression Inventory Scale indicates a presence of moderate to marked depression. If a participant has a score within this range, a referral for counseling will be made. The participant will receive a personal phone call by the primary investigator in addition to receiving a list of community referral numbers for counseling.

7. Benefits:

Administrators, clinicians, and researchers at Memorial Hospital recognize the importance of finding meaningful and effective ways for employees to reduce stress and improve the quality of their lives. This program teaches emotional self-management, may lower reported stress, and may increase emotional intelligence scores.

8. Confidentiality:

All questionnaires related to this study will be kept in a confidential file at the Multi-Health Systems, Inc. in Toronto, Canada. Multi-Health Systems, Inc. will only keep questionnaires until July 1, 2004, and then all paper will be properly shredded and all electronic data deleted. Only group data will be given to the primary investigator. Only group data will be used in published results or presentations. If any participant wishes to have a one on one session to discuss their personal emotional intelligence scores, the participant will sign a written permission form, separate from the Consent form needed to participate in this study. Only with a signed permission form will a certified administrator/coach of the EQ-i have access to the participant's EQ-i results. Only three EQ-i certified administrators/coaches would be used on this separate consent form: George, Soper, Deborah Drendall, and Sara Hake. All Zung Depression Scale questionnaires related to this study will be kept confidential in a locked cabinet in the Congregational Nurse Department of Memorial Hospital. Each subject completing the Zung self-rating Depression Scale will be asked to provide the last four digits of their Social Security number as an identifying number in order to match the scores from each of the two times the participant takes the self-rating scale. It is important to note that the person responsible for the data analysis does not have access to identifying information. The last four digits of the Social Security numbers make the surveys anonymous to the data analyst. Only group data will be used in published results or presentations.

9. Costs:
There is no cost to the individual who consents to participate in the study. All Memorial Hospital employees who participate in the intervention HeartMath group will request permission from their unit director. Memorial covers the cost of $60/employee for HeartMath books. The primary investigator is covering the cost of all emotional intelligence and depression testing.

10. Duration of Study:
This study begins the third week of April 2004. The duration of the entire study is six weeks. Approximate date for completion is at the end of the second week June 2004.

11. Other Information:
Qualifications of Investigators
Principal Investigator:
Sara Hake, B.S.N., R.N., M.Ed., ABD doctoral student
Manager of Congregational Nursing Program, Memorial Hospital

Collaborating Investigators:
Neil L. Gilbert, M.A., M.S.W., L.C.S.W.
Research Coordinator, HeartMath Trainer, Organizational Effectiveness, Memorial Hospital

George Soper, Ph.D.
Vice-President Memorial Hospital
Certified coach and administrator of the EQ-i exam

Deborah Drendall, BME/BA, M.M.
Organizational Effectiveness, Memorial Hospital
Certified coach and administrator of the EQ-i exam

Status of FDA filing
Not applicable

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	Day of Week	Day of Week	Day of Week	Day of Week	Day of Week	Day of Week	Day of Week
Week 1 Date:							
Week 2 Date:							
Week 3 Date:							
Week 4 Date:							
Week 5 Date:							
Week 6 Date:							

Starting Date: _____   Name: _____

Ending Date: _____

Key: Each check mark (√) equals 10 minutes of Heart Lock-in
Each (FF) equals each time Freeze Frame was used
Each (N) equals each time Neutral was used

APPENDIX E
Additional Test Subject Demographics

The following demographics were not considered for this test, but are presented as additional data for the reader.

The marital status data of the test subjects are presented in Table 19 below.

	Intervention	Control
Single	21	11
Married	28	13
Partnered	5	3
Separated	0	0
Divorced	22	8
Widowed	7	3

Table 19. Marital Status of Intervention and Control Groups.

The educational levels data of the test subjects are presented in Table 20 below.

	Intervention	Control
Elementary	0	0
Junior/Middle School	2	0
High School	12	4
Technical School	10	5
Some College/Associate's Degree	9	6
Bachelor's Degree	20	14
Some Graduate	13	3
Master's Degree	12	4
Doctorate Degree	5	2

Table 20. Level of Education for Intervention and Control Groups.

Data pertaining to employment type and hours worked per week are presented in

Table 21 and Table 22 (respectively) below.

	Intervention	Control
Student	15	10
Laborer	3	1
Skilled or Clerical	6	3
Management	19	3
Professional	21	16
Executive	3	2
Engineer/Technical	6	1
Retired	8	2
Unemployed	2	0
Other	0	0

Table 21. Employment Status for Intervention and Control Groups.

	Intervention	Control
Less than 25 hours	**12**	**1**
26-35 hours	**2**	**3**
36-40 hours	**13**	**5**
41-50 hours	**42**	**26**
51-59 hours	**9**	**3**
60 or more hours	**5**	**0**

**Table 22. Hours/week Usually Worked for Intervention and Control
Groups.**

APPENDIX F
Raw Data

The following tables present the raw pre- and post-test subscale scores for the

control and intervention groups.

S#	EQ Pre-C	EQ Post-C
1	82	92
2	57	75
3	101	104
4	102	86
5	118	101
6	105	100
7	83	77
8	84	80
9	101	95
10	66	57
11	100	94
12	91	97
13	92	80
14	106	108
15	80	65
16	89	86
17	106	105
18	101	97
19	78	67
20	108	83
21	69	76
22	99	92
23	81	96
24	96	101
25	101	92
26	85	88
27	97	103
28	97	96
29	119	110
30	108	105
31	98	94
32	113	115
33	120	116
34	111	102
35	96	72
36	101	99
37	100	106
38	84	76

S#	EQ Pre-I	EQ Post-I	S#	EQ Pre-I	EQ Post-I
1	97	91	43	89	81
2	121	112	44	112	109
3	107	117	45	83	70
4	90	86	46	57	58
5	101	101	47	112	110
6	79	74	48	98	93
7	103	107	49	81	99
8	102	95	50	90	89
9	113	110	51	110	108
10	103	97	52	111	108
11	79	67	53	81	81
12	98	107	54	90	87
13	89	88	55	122	117
14	103	115	56	83	80
15	86	88	57	122	123
16	96	95	58	108	119
17	93	92	59	111	121
18	121	114	60	85	82
19	108	113	61	98	105
20	117	100	62	99	102
21	91	91	63	101	96
22	119	117	64	92	94
23	114	111	65	88	101
24	106	116	66	53	55
25	105	101	67	97	95
26	102	109	68	111	116
27	109	104	69	90	86
28	118	115	70	102	100
29	91	106	71	99	112
30	109	116	72	103	108
31	112	105	73	96	102
32	111	116	74	96	102
33	107	107	75	108	104
34	77	83	76	100	115
35	81	86	77	107	106
36	81	92	78	77	70
37	126	111	79	101	116
38	81	74	80	68	68
39	84	93	81	108	106
40	75	72	82	119	116
41	86	102	83	101	102
42	114	116			

Table 23. Raw Data for Total Emotional Quotient (EQ).

S#	SR Pre-C	SR Post-C		S#	SR Pre-I	SR Post-I		S#	SR Pre-I	SR Post-I
1	91	92		1	96	91		43	84	81
2	76	75		2	115	105		44	112	102
3	99	104		3	83	102		45	77	68
4	85	86		4	69	70		46	71	71
5	104	101		5	108	104		47	115	114
6	104	100		6	81	81		48	112	112
7	77	77		7	111	109		49	95	91
8	76	80		8	101	95		50	97	94
9	95	95		9	105	113		51	117	115
10	58	57		10	105	99		52	117	118
11	95	94		11	41	43		53	73	71
12	97	97		12	107	112		54	90	89
13	86	80		13	109	108		55	118	118
14	108	108		14	113	113		56	91	91
15	67	65		15	88	90		57	115	114
16	88	86		16	74	86		58	108	113
17	99	105		17	86	85		59	99	101
18	104	97		18	112	111		60	69	68
19	65	67		19	113	108		61	93	107
20	83	83		20	108	110		62	106	104
21	74	76		21	105	108		63	82	84
22	90	92		22	107	108		64	94	98
23	93	96		23	105	103		65	95	105
24	93	101		24	84	102		66	47	52
25	89	92		25	91	95		67	100	100
26	88	88		26	96	103		68	93	111
27	100	103		27	110	107		69	70	69
28	94	96		28	125	118		70	96	98
29	111	110		29	86	98		71	90	96
30	108	105		30	90	105		72	88	99
31	95	94		31	113	111		73	87	98
32	115	115		32	108	110		74	93	95
33	119	116		33	108	109		75	104	103
34	102	102		34	96	100		76	100	107
35	74	72		35	71	72		77	104	108
36	99	99		36	71	80		78	83	69
37	111	106		37	115	110		79	89	103
38	76	76		38	93	87		80	72	70
				39	96	96		81	101	103
				40	68	69		82	94	94
				41	88	105		83	92	100
				42	108	113				

Table 24. Raw Data for Self Regard (SR).

| | ES | ES | | ES | ES | | ES | ES |
S#	Pre-C	Post-C	S#	Pre-I	Post-I		Pre-I	Post-I
1	89	89	1	104	109		69	70
2	71	74	2	128	125		126	125
3	111	114	3	102	118		87	80
4	90	87	4	82	81		75	78
5	109	111	5	94	99		128	123
6	111	111	6	106	98		106	105
7	78	84	7	84	86		94	-99
8	93	95	8	105	105		61	69
9	86	86	9	119	121		122	119
10	77	73	10	99	91		103	100
11	103	103	11	110	100		92	93
12	91	88	12	91	102		86	85
13	110	103	13	77	85		131	124
14	118	118	14	101	109		113	110
15	89	89	15	87	89		97	122
16	77	77	16	125	108		114	124
17	103	111	17	113	100		122	127
18	98	97	18	117	112		97	95
19	59	56	19	103	114		112	114
20	102	105	20	120	100		109	120
21	94	96	21	92	98		104	102
22	103	98	22	100	97		91	102
23	84	84	23	125	126		95	103
24	109	109	24	102	118		51	59
25	101	98	25	105	99		84	86
26	87	84	26	112	117		120	118
27	91	87	27	108	104		95	96
28	89	92	28	112	115		108	108
29	117	123	29	77	94		101	105
30	108	113	30	108	126		91	99
31	112	105	31	111	105		97	105
32	126	126	32	115	122		109	105
33	128	122	33	118	115		122	116
34	119	118	34	71	81		110	118
35	125	124	35	89	95		105	96
36	111	111	36	89	105	78	70	76
37	84	87	37	118	106	79	101	121
38	95	95	38	84	70	80	90	90
			39	93	91	81	84	87
			40	88	90	82	130	127
			41	87	94	83	84	88
			42	108	112			

Table 25. Raw Data for Emotional Self-Awareness (ES).

S#	AS Pre-C	AS Post-C
1	75	78
2	72	72
3	110	110
4	97	104
5	110	107
6	104	104
7	84	78
8	78	78
9	75	78
10	130	130
11	84	88
12	101	101
13	88	84
14	104	104
15	94	94
16	62	62
17	94	104
18	117	113
19	65	68
20	88	88
21	62	59
22	84	81
23	81	78
24	101	101
25	91	91
26	78	72
27	81	81
28	94	97
29	117	117
30	120	120
31	101	101
32	107	107
33	107	107
34	107	113
35	107	107
36	110	110
37	104	107
38	78	78

S#	AS Pre-I	AS Post-I	S#	AS Pre-I	AS Post-I
1	94	97	43	91	94
2	117	113	44	107	104
3	88	104	45	81	72
4	84	91	46	68	78
5	117	110	47	97	97
6	78	78	48	88	84
7	104	113	49	88	-99
8	110	110	50	78	78
9	104	107	51	117	117
10	81	81	52	104	104
11	88	88	53	78	84
12	91	107	54	84	81
13	75	78	55	120	120
14	113	117	56	91	88
15	78	72	57	101	101
16	107	88	58	117	130
17	88	84	59	107	113
18	126	130	60	88	88
19	91	97	61	107	107
20	97	91	62	97	97
21	104	101	63	81	81
22	113	110	64	101	97
23	117	113	65	97	117
24	88	104	66	62	65
25	101	107	67	81	84
26	113	120	68	107	117
27	97	97	69	65	72
28	113	117	70	110	107
29	62	94	71	84	97
30	101	101	72	97	107
31	117	120	73	88	97
32	113	120	74	97	94
33	104	97	75	120	120
34	68	72	76	91	97
35	91	94	77	107	110
36	91	94	78	81	65
37	123	117	79	91	107
38	81	78	80	88	88
39	72	75	81	107	107
40	81	81	82	94	94
41	78	84	83	75	75
42	110	107			

Table 26. Raw Data for Assertiveness (AS).

S#	IN Pre-C	IN Post-C
1	79	75
2	62	59
3	112	115
4	109	112
5	105	105
6	95	85
7	95	95
8	95	92
9	72	75
10	126	126
11	92	95
12	92	92
13	112	109
14	89	89
15	112	112
16	89	89
17	115	119
18	109	109
19	85	92
20	115	115
21	52	45
22	92	92
23	75	72
24	92	85
25	99	99
26	79	79
27	112	115
28	102	112
29	122	126
30	119	119
31	109	109
32	112	112
33	119	112
34	99	95
35	109	109
36	109	109
37	115	112
38	95	95

S#	IN Pre-I	IN Post-I	S#	IN Pre-I	IN Post-I
1	95	89	43	82	75
2	119	115	44	112	109
3	115	119	45	72	65
4	99	85	46	59	59
5	109	105	47	102	102
6	72	72	48	92	95
7	115	112	49	75	72
8	102	99	50	105	105
9	99	112	51	109	112
10	99	99	52	115	112
11	92	82	53	79	79
12	95	89	54	102	102
13	82	89	55	119	115
14	102	109	56	95	95
15	75	75	57	119	105
16	112	119	58	119	119
17	112	102	59	105	109
18	119	119	60	75	72
19	85	89	61	109	112
20	92	85	62	89	89
21	85	85	63	89	82
22	109	112	64	92	95
23	105	109	65	95	109
24	115	119	66	99	99
25	95	102	67	92	89
26	115	122	68	95	115
27	109	115	69	92	89
28	119	122	70	99	99
29	89	95	71	92	102
30	102	102	72	109	102
31	112	112	73	99	95
32	119	115	74	89	95
33	89	82	75	109	105
34	62	72	76	85	85
35	109	109	77	102	102
36	112	112	78	85	82
37	119	99	79	99	109
38	75	75	80	89	89
39	89	102	81	109	105
40	82	75	82	119	115
41	79	95	83	72	69
42	122	122			

Table 27. Raw Data for Independence (IN).

S#	SA Pre-C	SA Post-C	S#	SA Pre-I	SA Post-I	S#	SA Pre-I	SA Post-I
1	90	87	1	104	102	43	93	83
2	85	84	2	108	109	44	107	103
3	115	117	3	116	111	45	75	62
4	115	116	4	85	73	46	60	64
5	117	116	5	100	101	47	87	86
6	103	101	6	84	66	48	83	79
7	98	100	7	97	99	49	100	96
8	107	106	8	110	105	50	104	103
9	112	109	9	110	112	51	119	116
10	98	101	10	107	108	52	115	106
11	100	100	11	59	51	53	75	73
12	78	81	12	102	107	54	90	89
13	96	95	13	76	73	55	123	113
14	112	112	14	98	114	56	77	83
15	78	78	15	94	95	57	120	113
16	105	105	16	89	95	58	98	109
17	112	117	17	96	89	59	117	115
18	101	94	18	102	103	60	84	83
19	84	87	19	112	115	61	101	106
20	116	116	20	120	101	62	107	106
21	78	80	21	74	77	63	108	85
22	95	88	22	120	120	64	81	92
23	86	84	23	116	103	65	97	106
24	113	110	24	110	111	66	31	28
25	110	113	25	111	101	67	95	95
26	94	91	26	97	99	68	121	121
27	110	109	27	110	101	69	76	75
28	109	109	28	123	123	70	109	109
29	117	117	29	105	108	71	100	114
30	98	98	30	107	99	72	116	115
31	101	100	31	108	99	73	97	98
32	107	107	32	109	112	74	110	105
33	120	117	33	112	103	75	113	93
34	110	106	34	105	97	76	99	115
35	89	88	35	75	84	77	121	116
36	115	115	36	75	90	78	83	66
37	94	86	37	118	109	79	110	115
38	107	110	38	86	79	80	70	70
			39	81	93	81	114	115
			40	63	65	82	125	118
			41	94	111	83	112	117
			42	117	120			

Table 28. Raw Data for Self-Actualization (SA).

S#	EM Pre-C	EM Post-C	S#	EM Pre-I	EM Post-I	S#	EM Pre-I	EM Post-I
1	95	84	1	116	105	43	112	102
2	84	80	2	105	95	44	112	105
3	116	120	3	112	116	45	91	84
4	112	116	4	98	91	46	95	95
5	112	120	5	102	98	47	116	112
6	109	109	6	120	112	48	87	87
7	80	87	7	80	91	49	105	102
8	102	98	8	112	102	50	73	77
9	116	116	9	120	102	51	109	105
10	59	59	10	109	102	52	120	120
11	116	116	11	116	105	53	105	105
12	102	105	12	87	95	54	95	95
13	120	120	13	91	87	55	105	112
14	112	112	14	105	116	56	109	105
15	105	105	15	105	112	57	123	123
16	95	95	16	123	109	58	98	120
17	116	109	17	120	109	59	120	123
18	102	102	18	120	109	60	102	95
19	95	98	19	116	120	61	98	105
20	112	112	20	123	98	62	109	116
21	105	105	21	98	98	63	123	123
22	116	116	22	120	105	64	102	87
23	84	84	23	120	116	65	70	80
24	109	109	24	109	116	66	62	70
25	109	109	25	109	105	67	98	95
26	105	102	26	87	87	68	120	102
27	105	105	27	105	98	69	102	98
28	112	116	28	102	98	70	91	87
29	120	123	29	95	98	71	116	116
30	102	105	30	109	112	72	112	116
31	95	84	31	109	105	73	95	105
32	112	112	32	116	123	74	109	116
33	105	102	33	112	102	75	123	116
34	120	116	34	87	102	76	105	116
35	123	123	35	105	105	77	98	102
36	112	112	36	105	120	78	84	80
37	80	84	37	123	120	79	109	112
38	102	102	38	84	87	80	48	44
			39	95	95	81	105	98
			40	102	95	82	116	116
			41	105	105	83	116	109
			42	120	120			

Table 29. Raw Data for Empathy (EM).

S#	RE Pre-C	RE Post-C
1	98	89
2	84	83
3	101	101
4	114	115
5	113	115
6	106	100
7	99	105
8	109	105
9	113	113
10	73	73
11	116	113
12	85	88
13	124	117
14	104	104
15	111	111
16	100	100
17	110	106
18	100	100
19	116	115
20	111	111
21	107	106
22	117	116
23	76	76
24	105	103
25	110	110
26	102	99
27	109	105
28	110	107
29	110	109
30	103	97
31	91	84
32	97	97
33	112	103
34	105	102
35	111	111
36	98	95
37	89	82
38	109	109

S#	RE Pre-I	RE Post-I	S#	RE Pre-I	RE Post-I
1	102	84	43	117	105
2	119	102	44	94	106
3	111	110	45	87	74
4	115	110	46	104	109
5	102	102	47	114	107
6	107	98	48	99	93
7	89	97	49	90	86
8	103	88	50	99	96
9	111	98	51	102	96
10	108	98	52	114	108
11	108	98	53	105	100
12	84	84	54	104	99
13	107	89	55	112	105
14	106	111	56	105	99
15	102	104	57	118	117
16	111	116	58	100	110
17	121	108	59	111	114
18	113	99	60	103	99
19	116	119	61	97	102
20	118	108	62	98	99
21	82	82	63	119	120
22	115	106	64	91	97
23	111	111	65	71	89
24	111	110	66	79	70
25	101	105	67	98	89
26	95	98	68	116	95
27	114	96	69	116	109
28	120	112	70	102	102
29	103	100	71	116	117
30	108	109	72	114	99
31	112	101	73	113	96
32	102	111	74	105	109
33	104	103	75	112	111
34	98	107	76	107	113
35	110	117	77	104	109
36	110	112	78	83	83
37	116	104	79	110	110
38	76	76	80	56	59
39	97	91	81	113	105
40	101	91	82	116	116
41	102	97	83	113	122
42	109	106			

Table 30. Raw Data for Social Responsibility (RE).

S#	IR Pre-C	Post-C
1	77	78
2	91	91
3	123	123
4	103	101
5	118	114
6	108	104
7	66	71
8	94	96
9	112	109
10	83	77
11	111	111
12	87	87
13	78	72
14	110	110
15	83	83
16	97	98
17	118	117
18	96	101
19	53	50
20	109	112
21	103	100
22	112	104
23	94	92
24	94	100
25	107	102
26	81	83
27	115	116
28	108	111
29	121	123
30	112	106
31	107	108
32	107	109
33	121	116
34	108	108
35	109	103
36	121	121
37	87	86
38	97	97

S#	IR Pre-I	IR Post-I	S#	IR Pre-I	IR Post-I
1	104	96	43	88	87
2	118	111	44	107	111
3	109	108	45	90	87
4	63	61	46	73	71
5	93	87	47	103	102
6	105	103	48	75	74
7	88	84	49	99	87
8	99	92	50	74	79
9	108	107	51	107	107
10	111	107	52	111	111
11	84	79	53	74	78
12	92	107	54	113	112
13	76	79	55	121	119
14	111	112	56	117	109
15	81	82	57	123	119
16	112	102	58	112	115
17	78	85	59	108	121
18	104	102	60	87	86
19	116	118	61	104	106
20	120	112	62	99	100
21	96	93	63	107	106
22	112	113	64	87	89
23	113	115	65	76	81
24	109	105	66	34	39
25	94	92	67	107	104
26	100	104	68	99	99
27	101	98	69	101	95
28	109	106	70	96	92
29	98	110	71	111	113
30	109	113	72	103	113
31	117	107	73	111	115
32	110	118	74	97	97
33	110	116	75	111	112
34	78	88	76	90	106
35	83	86	77	105	103
36	83	87	78	83	78
37	113	103	79	107	122
38	94	93	80	66	64
39	92	94	81	100	97
40	81	77	82	115	115
41	81	90	83	114	118
42	123	125			

Table 31. Raw Data for Interpersonal Relationship (IR).

S#	ST Pre-C	ST Post-C	S#	ST Pre-I	ST Post-I	S#	ST Pre-I	ST Post-I
1	96	92	1	96	98	43	88	84
2	63	61	2	110	104	44	113	116
3	89	86	3	99	108	45	89	77
4	97	102	4	101	101	46	69	77
5	118	122	5	99	109	47	101	101
6	112	107	6	53	53	48	111	110
7	98	100	7	108	116	49	86	76
8	71	68	8	95	93	50	98	92
9	98	96	9	108	99	51	100	99
10	58	57	10	106	104	52	108	104
11	90	87	11	90	77	53	83	79
12	90	90	12	100	102	54	85	83
13	82	80	13	94	95	55	114	114
14	94	94	14	102	106	56	73	75
15	80	77	15	100	102	57	116	120
16	94	94	16	85	93	58	112	112
17	95	96	17	82	94	59	96	112
18	100	99	18	122	114	60	86	87
19	93	90	19	92	108	61	100	105
20	102	104	20	111	92	62	88	90
21	69	68	21	94	91	63	90	86
22	90	90	22	110	108	64	95	98
23	92	92	23	100	99	65	100	110
24	90	90	24	98	108	66	93	97
25	97	97	25	111	110	67	96	93
26	98	95	26	99	106	68	117	114
27	78	79	27	100	102	69	82	75
28	100	100	28	101	98	70	110	112
29	119	122	29	92	110	71	90	98
30	114	116	30	110	111	72	98	97
31	97	92	31	106	108	73	92	100
32	113	113	32	106	112	74	90	100
33	114	114	33	94	86	75	99	100
34	106	105	34	75	70	76	100	114
35	85	81	35	75	72	77	99	108
36	89	89	36	77	79	78	84	91
37	99	100	37	116	110	79	97	105
38	71	71	38	92	81	80	83	84
			39	90	96	81	108	109
			40	74	75	82	119	116
			41	100	100	83	101	97
			42	110	116			

Table 32. Raw Data for Stress Tolerance (ST).

S#	IC Pre-C	IC Post-C
1	98	98
2	46	42
3	81	89
4	113	114
5	99	98
6	109	110
7	106	106
8	96	98
9	119	116
10	36	36
11	105	105
12	104	104
13	110	103
14	110	110
15	88	85
16	114	115
17	107	107
18	96	96
19	123	123
20	117	117
21	87	86
22	103	103
23	83	81
24	85	81
25	100	100
26	109	112
27	109	111
28	70	67
29	102	104
30	106	103
31	118	114
32	115	113
33	105	104
34	114	114
35	109	109
36	81	84
37	110	101
38	96	96

S#	IC Pre-I	IC Post-I	S#	IC Pre-I	IC Post-I
1	101	99	43	112	104
2	110	106	44	115	107
3	117	118	45	104	103
4	123	118	46	66	68
5	92	90	47	120	119
6	71	76	48	114	112
7	110	114	49	80	79
8	85	78	50	111	111
9	114	107	51	96	93
10	100	102	52	92	93
11	93	89	53	111	112
12	101	112	54	98	93
13	119	116	55	107	95
14	93	102	56	77	77
15	109	113	57	118	119
16	109	100	58	109	110
17	110	107	59	92	105
18	107	110	60	106	103
19	111	110	61	118	109
20	110	104	62	105	105
21	106	109	63	102	101
22	98	102	64	104	111
23	108	111	65	87	97
24	116	118	66	105	108
25	124	98	67	111	106
26	99	101	68	100	108
27	90	92	69	113	112
28	112	115	70	88	85
29	115	117	71	105	122
30	117	120	72	114	113
31	96	96	73	113	114
32	108	105	74	85	96
33	110	110	75	85	86
34	89	97	76	118	121
35	98	106	77	103	93
36	98	96	78	80	88
37	113	102	79	100	121
38	83	88	80	101	98
39	88	107	81	113	114
40	93	89	82	111	114
41	109	120	83	119	118
42	96	96			

Table 33. Raw Data for Impulse Control (IC).

S#	RT Pre-C	RT Post-C
1	97	95
2	47	44
3	71	68
4	100	100
5	122	120
6	107	105
7	106	116
8	85	89
9	107	107
10	69	73
11	101	101
12	90	85
13	106	99
14	116	116
15	93	93
16	89	95
17	87	91
18	95	99
19	110	107
20	118	118
21	63	63
22	101	101
23	87	85
24	109	109
25	108	108
26	98	95
27	81	74
28	93	93
29	93	101
30	115	114
31	89	85
32	114	114
33	120	114
34	114	111
35	93	92
36	71	68
37	107	100
38	85	82

S#	RT Pre-I	RT Post-I	S#	RT Pre-I	RT Post-I
1	85	88	43	85	79
2	118	113	44	114	109
3	118	116	45	94	93
4	104	96	46	88	85
5	94	104	47	114	117
6	88	82	48	109	102
7	108	109	49	78	79
8	106	101	50	98	97
9	117	113	51	95	99
10	101	93	52	97	97
11	80	72	53	91	93
12	97	111	54	69	67
13	100	95	55	130	120
14	97	115	56	73	69
15	98	99	57	109	126
16	96	99	58	115	116
17	109	94	59	105	118
18	118	112	60	100	95
19	100	114	61	92	103
20	112	89	62	105	112
21	94	94	63	115	116
22	122	117	64	87	98
23	109	105	65	95	105
24	118	116	66	93	92
25	98	99	67	112	109
26	105	109	68	96	112
27	106	97	69	104	105
28	96	96	70	108	105
29	95	108	71	101	120
30	116	120	72	101	111
31	118	101	73	104	111
32	107	116	74	106	111
33	116	110	75	102	103
34	83	89	76	95	117
35	96	107	77	108	97
36	96	117	78	92	93
37	120	100	79	108	119
38	87	79	80	86	87
39	82	93	81	109	101
40	87	91	82	120	119
41	98	116	83	107	89
42	89	93			

Table 34. Raw Data for Reality Testing (RT).

S#	FL Pre-C	FL Post-C
1	91	94
2	77	80
3	121	124
4	95	95
5	116	127
6	102	109
7	70	66
8	61	48
9	88	88
10	65	64
11	91	97
12	80	80
13	70	62
14	79	79
15	79	79
16	93	93
17	115	124
18	85	84
19	64	55
20	96	93
21	77	74
22	91	94
23	79	76
24	84	85
25	88	88
26	82	89
27	108	107
28	97	103
29	125	128
30	96	99
31	88	83
32	103	100
33	112	111
34	108	108
35	115	114
36	121	118
37	104	105
38	61	61

S#	FL Pre-I	FL Post-I	S#	FL Pre-I	FL Post-I
1	95	91	43	88	85
2	130	120	44	103	96
3	96	110	45	89	74
4	108	103	46	66	57
5	88	92	47	117	116
6	66	75	48	103	96
7	108	109	49	80	79
8	99	90	50	70	76
9	108	95	51	93	93
10	99	99	52	94	94
11	98	81	53	95	96
12	99	111	54	103	99
13	109	104	55	111	104
14	98	100	56	68	71
15	85	84	57	109	127
16	115	102	58	96	107
17	70	87	59	108	123
18	122	113	60	84	82
19	112	100	61	88	96
20	109	109	62	82	84
21	104	98	63	95	93
22	124	112	64	80	77
23	99	100	65	97	79
24	95	110	66	43	46
25	105	93	67	119	116
26	101	110	68	105	113
27	127	120	69	115	111
28	125	119	70	111	108
29	93	99	71	91	114
30	105	100	72	96	92
31	109	102	73	84	98
32	100	99	74	84	93
33	82	100	75	102	96
34	65	66	76	101	116
35	69	73	77	93	92
36	69	68	78	88	80
37	126	110	79	88	94
38	79	83	80	85	83
39	77	87	81	119	120
40	90	95	82	113	110
41	85	93	83	88	80
42	124	125			

Table 35. Raw Data for Flexibility (FL).

S#	PS Pre-C	PS Post-C
1	94	95
2	67	60
3	64	61
4	96	96
5	117	120
6	103	104
7	89	88
8	92	98
9	107	107
10	67	59
11	101	100
12	113	109
13	108	100
14	105	105
15	91	91
16	67	70
17	81	80
18	111	107
19	115	118
20	112	112
21	53	53
22	101	101
23	85	85
24	97	97
25	114	114
26	95	92
27	67	59
28	91	100
29	97	104
30	67	64
31	101	96
32	117	117
33	96	96
34	103	102
35	110	109
36	64	67
37	89	86
38	92	92

S#	PS Pre-I	PS Post-I	S#	PS Pre-I	PS Post-I
1	96	97	43	110	102
2	116	119	44	117	116
3	112	121	45	111	102
4	99	107	46	68	65
5	114	112	47	106	107
6	107	97	48	91	86
7	96	104	49	73	68
8	100	97	50	85	85
9	103	99	51	119	119
10	100	90	52	104	107
11	115	94	53	95	96
12	100	95	54	81	77
13	67	73	55	93	96
14	99	111	56	96	92
15	95	97	57	120	99
16	110	87	58	71	105
17	108	116	59	122	125
18	114	105	60	97	95
19	97	100	61	101	93
20	110	100	62	105	111
21	85	79	63	112	103
22	126	123	64	116	100
23	106	110	65	94	124
24	112	121	66	125	125
25	96	109	67	78	81
26	99	105	68	129	117
27	113	109	69	87	86
28	114	117	70	90	90
29	70	90	71	101	109
30	109	126	72	96	106
31	87	86	73	107	95
32	101	93	74	97	106
33	105	113	75	96	90
34	96	98	76	118	114
35	94	101	77	122	118
36	94	116	78	78	69
37	121	108	79	114	117
38	85	83	80	72	73
39	100	94	81	115	112
40	102	92	82	108	104
41	95	110	83	107	112
42	87	87			

Table 36. Raw Data for Problem Solving (PS).

S#	OP Pre-C	OP Post-C		S#	OP Pre-I	OP Post-I		S#	OP Pre-I	OP Post-I
1	88	91		1	107	98		43	87	80
2	71	70		2	115	106		44	111	117
3	109	109		3	104	119		45	87	75
4	110	114		4	98	96		46	67	75
5	113	112		5	110	114		47	104	103
6	100	104		6	87	84		48	97	96
7	87	83		7	107	109		49	79	-99
8	74	73		8	112	109		50	100	93
9	96	96		9	104	96		51	114	114
10	87	86		10	101	102		52	117	117
11	100	99		11	96	74		53	82	83
12	92	92		12	101	104		54	108	107
13	74	76		13	82	85		55	118	121
14	103	103		14	94	117		56	90	83
15	78	71		15	95	97		57	115	114
16	105	105		16	87	91		58	112	117
17	109	112		17	74	83		59	116	114
18	110	103		18	116	106		60	71	73
19	78	81		19	102	106		61	98	110
20	108	108		20	109	97		62	101	106
21	77	79		21	84	84		63	112	116
22	100	96		22	122	122		64	92	94
23	94	98		23	111	113		65	93	106
24	114	110		24	104	119		66	71	75
25	110	110		25	112	108		67	76	76
26	95	102		26	96	106		68	119	113
27	94	97		27	108	104		69	79	78
28	99	99		28	119	112		70	100	100
29	119	119		29	102	105		71	100	104
30	115	115		30	98	105		72	111	107
31	98	96		31	112	108		73	93	94
32	111	111		32	106	114		74	114	108
33	119	115		33	106	99		75	111	113
34	98	97		34	85	99		76	111	120
35	93	92		35	74	75		77	109	118
36	109	109		36	77	85		78	73	74
37	106	91		37	120	120		79	110	113
38	74	74		38	94	86		80	61	65
				39	91	95		81	115	117
				40	70	66		82	110	106
				41	95	105		83	96	105
				42	119	122				

Table 37. Raw Data for Optimism (OP).

S#	HA Pre-C	HA Post-C
1	63	57
2	87	81
3	112	115
4	101	102
5	114	113
6	96	96
7	72	75
8	96	98
9	106	106
10	88	85
11	95	97
12	100	100
13	70	66
14	112	112
15	69	69
16	105	108
17	114	114
18	99	96
19	59	56
20	104	107
21	100	97
22	98	97
23	105	106
24	84	85
25	83	77
26	69	72
27	108	110
28	100	97
29	117	117
30	102	99
31	82	81
32	82	85
33	108	99
34	110	95
35	72	72
36	112	112
37	100	85
38	99	99

S#	HA Pre-I	HA Post-I	S#	HA Pre-I	HA Post-I
1	102	87	43	101	93
2	114	107	44	82	105
3	107	111	45	84	72
4	64	65	46	51	56
5	98	93	47	102	97
6	83	80	48	96	95
7	104	99	49	101	86
8	102	94	50	107	101
9	110	112	51	110	107
10	110	108	52	112	113
11	58	59	53	83	85
12	99	113	54	109	107
13	95	100	55	105	104
14	108	112	56	81	75
15	69	65	57	117	116
16	69	94	58	102	109
17	73	84	59	110	110
18	114	109	60	84	78
19	118	117	61	74	95
20	117	107	62	103	110
21	108	108	63	97	99
22	113	117	64	100	90
23	110	104	65	98	94
24	107	111	66	24	30
25	100	90	67	106	113
26	97	103	68	100	112
27	95	89	69	88	79
28	125	114	70	110	107
29	108	113	71	95	99
30	107	99	72	101	109
31	105	94	73	86	90
32	109	113	74	87	99
33	112	117	75	105	106
34	91	89	76	91	103
35	68	69	77	91	102
36	68	76	78	104	84
37	115	112	79	83	100
38	105	96	80	66	72
39	99	102	81	94	93
40	81	85	82	121	118
41	69	88	83	106	120
42	117	114			

Table 38. Raw Data for Happiness (HA).

APPENDIX G
Intervention Raw Data

The following data in Table 39 represent the numbers and types of HeartMath interventions performed by the intervention group. HL = 55 subjects; N = 48 subjects; and FF = 52 subjects. Note that twenty of the eighty-three intervention subjects actually did not perform any intervention, although they did receive training. These subjects' data are listed in red. Note also that an additional twenty-three of the intervention subjects only performed one or two of the three HeartMath interventions. These subjects' data are listed in green.

	Intervention				Intervention				Intervention				Intervention		
S#	HL	N	FF	S#	HL	N	FF	S#	HL	N	FF	S#	HL	N	FF
1	10	0	0	22	10	2	2	43	0	0	0	64	50	18	3
2	0	0	0	23	10	0	2	44	0	2	0	65	120	33	46
3	110	19	22	24	40	21	13	45	0	0	0	66	30	2	15
	0	2	2	25	10	0	0	46	20	1	3		10	2	2
5	10	3	2	26	40	3	12	47	0	0	0	68	50	10	17
6	20	0	1	27	0	0	0	48	0	0	0	69	0	0	0
7	20	0	0		0	0	0	49	90	16	12	70	0	0	0
	0	1	2	29	40	3	14	50	10	0	0	71	40	9	9
9	0	1	3		130	18	6	51	0	0	0		10	4	4
10	10	3	2	31	0	0	0		0	0	0	73	30	8	3
11	0	0	0	32	30	5	3	53	0	0	0	74	40	8	7
12	60	4	10	33	10	0	2		10	1	0	75	10	0	0
13	0	0	0	34	30	10	7	55	0	0	1		90	22	25
14	70	18	14	35	30	12	9	56	10	2	1	77	10	3	3
	20	9	13	36	40	14	8	57	20	3	5		0	2	0
16	10	0	2	37	0	1	1	58	90	12	18	79	60	14	22
17	20	2	2	38	0	0	1	59	120	25	16	80	20	0	0
18	10	1	0		50	22	25	60	0	0	0	81	0	0	0
	70	14	25	40	0	0	0	61	20	6	10	82	0	0	0
20	10	0	2		80	34	23	62	30	18	10	83	10	0	5
21	20	0	0	42	30	15	4		0	0	0				

Table 39. Intervention Technique Raw Data.

Table 40, page 153, shows this data in relation to the pre- and post-test EQ scores.

S#	EQ Pre-I	EQ Post-I	Intervention HL	N	FF	S#	EQ Pre-I	EQ Post-I	Intervention HL	N	FF
1	97	91	10	0	0	43	89	81	0	0	0
2	121	112	0	0	0	44	112	109	0	2	0
3	107	117	110	19	22	45	83	70	0	0	0
4	90	86	0	2	2	46	57	58	20	1	3
5	101	101	10	3	2	47	112	110	0	0	0
6	79	74	20	0	1	48	98	93	0	0	0
7	103	107	20	0	0	49	81	99	90	16	12
8	102	95	0	1	2	50	90	89	10	0	0
9	113	110	0	1	3	51	110	108	0	0	0
10	103	97	10	3	2	52	111	108	0	0	0
11	79	67	0	0	0	53	81	81	0	0	0
12	98	107	60	4	10	54	90	87	10	1	0
13	89	88	0	0	0	55	122	117	0	0	1
14	103	115	70	18	14	56	83	80	10	2	1
15	86	88	20	9	13	57	122	123	20	3	5
16	96	95	10	0	2	58	108	119	90	12	18
17	93	92	20	2	2	59	111	121	120	25	16
18	121	114	10	1	0	60	85	82	0	0	0
19	108	113	70	14	25	61	98	105	20	6	10
20	117	100	10	0	2	62	99	102	30	18	10
21	91	91	20	0	0	63	101	96	0	0	0
22	119	117	10	2	2	64	92	94	50	18	3
23	114	111	10	0	2	65	88	101	120	33	46
24	106	116	40	21	13	66	53	55	30	2	15
25	105	101	10	0	0	67	97	95	10	2	2
26	102	109	40	3	12	68	111	116	50	10	17
27	109	104	0	0	0	69	90	86	0	0	0
28	118	115	0	0	0	70	102	100	0	0	0
29	91	106	40	3	14	71	99	112	40	9	9
30	109	116	130	18	6	72	103	108	10	4	4
31	112	105	0	0	0	73	96	102	30	8	3
32	111	116	30	5	3	74	96	102	40	8	7
33	107	107	10	0	2	75	108	104	10	0	0
34	77	83	30	10	7	76	100	115	90	22	25
35	81	86	30	12	9	77	107	106	10	3	3
36	81	92	40	14	8	78	77	70	0	2	0
37	126	111	0	1	1	79	101	116	60	14	22
38	81	74	0	0	1	80	68	68	20	0	0
39	84	93	50	22	25	81	108	106	0	0	0
40	75	72	0	0	0	82	119	116	0	0	0
41	86	102	80	34	23	83	101	102	10	0	5
42	114	116	30	15	4						

Table 40. Intervention Group EQ Scores and Intervention Techniques Used.